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Soil
Conservation
Service

In cooperation with
New Mexico Agricultural
Experiment Station

Soil Survey of Mora County Area, New Mexico

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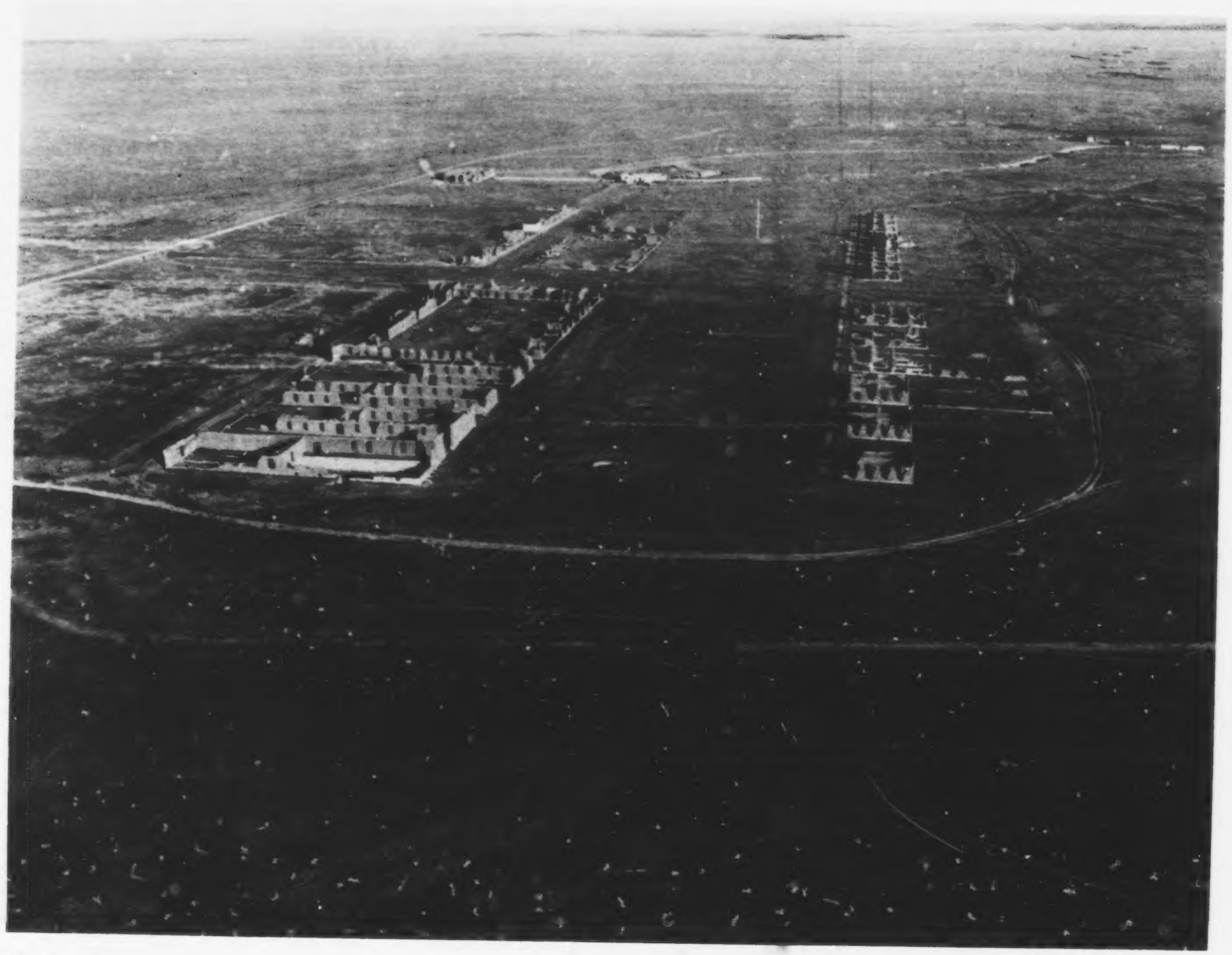

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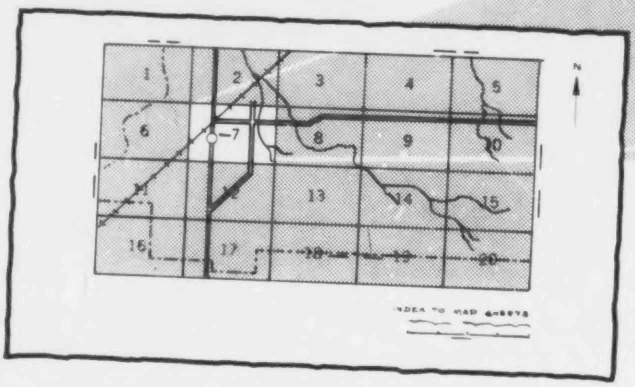
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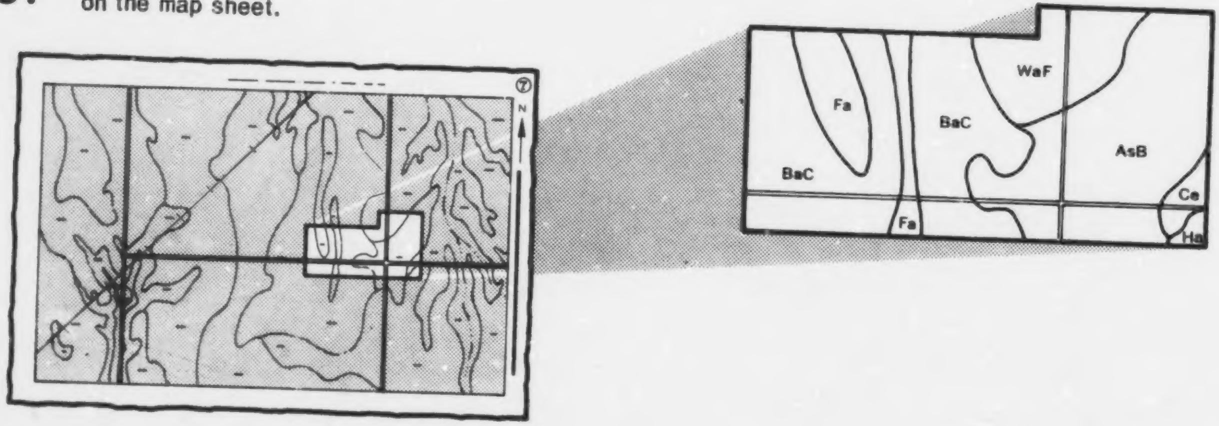
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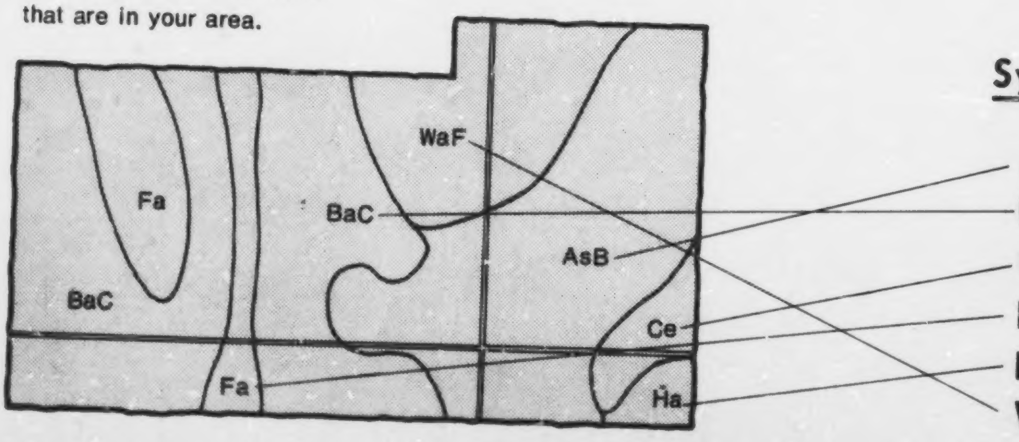
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THIS SOIL SURVEY

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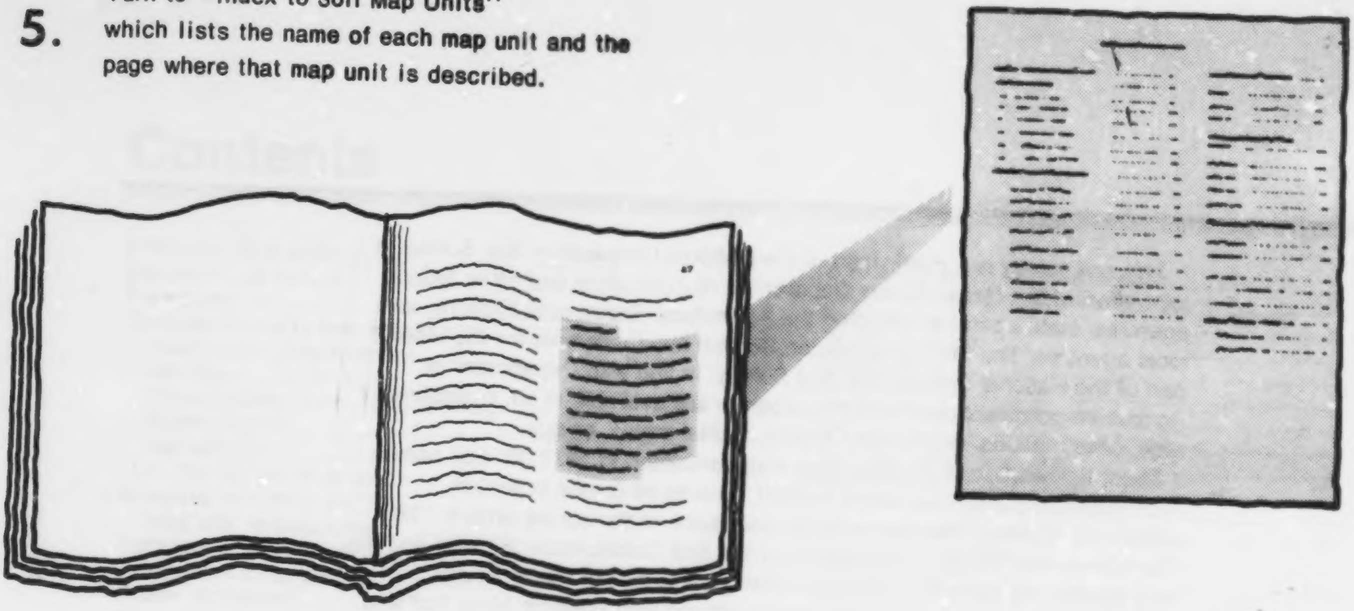
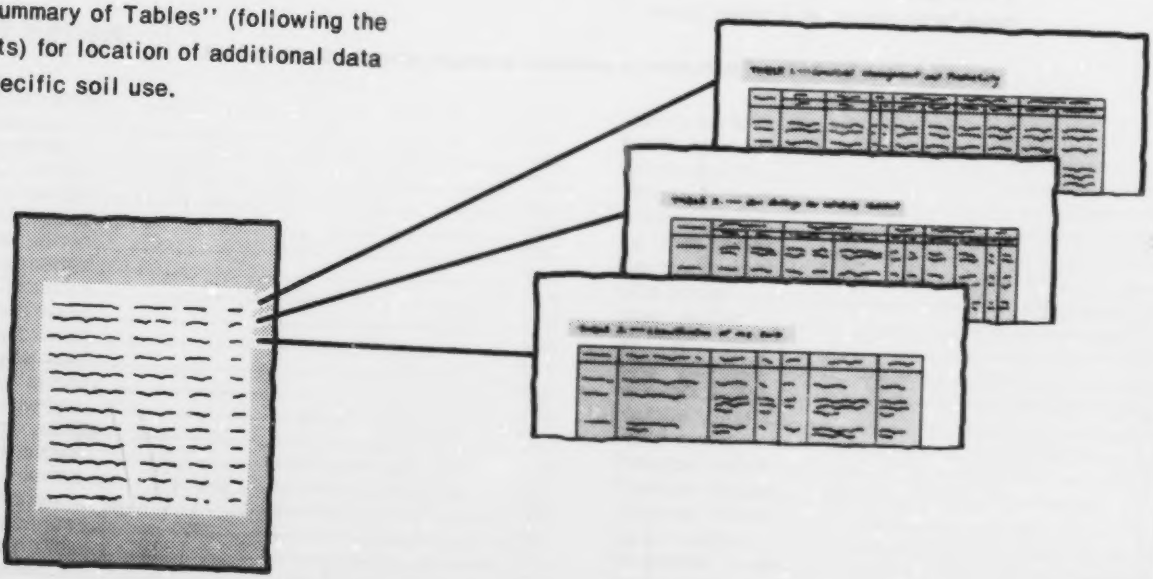


6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

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This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, or age.

Major fieldwork for this soil survey was completed in 1977-80. Soil names and descriptions were approved in 1981. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1981. This survey was made cooperatively by the Soil Conservation Service and the New Mexico Agricultural Experiment Station. It is part of the technical assistance furnished to the Mora-Wagon Mound and Western Mora Soil and Water Conservation Districts.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Fort Union National Monument, a prominent landmark along the Santa Fe Trail.

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Foreword

This soil survey contains information that can be used in land-planning programs in Mora County Area. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

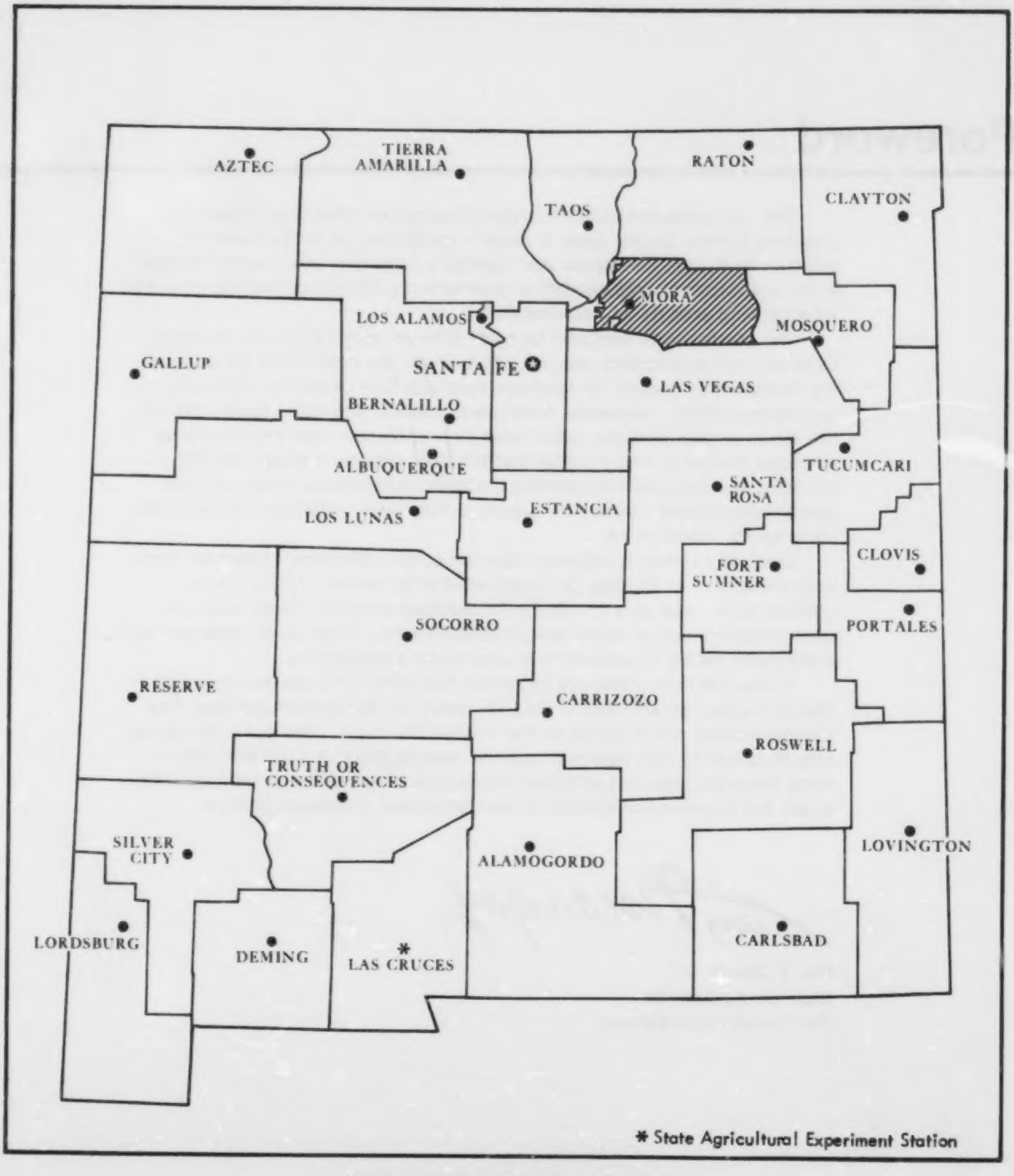
This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to insure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Ray T. Margo Jr.

Ray T. Margo, Jr.
State Conservationist
Soil Conservation Service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ALBUQUERQUE
TUCUMCARI
SANTA ROSA
LOS LUNAS
ESTANCIA
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ROSWELL
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Location of Mora County Area in New Mexico.

Soil Survey of
Mora County Area, New Mexico

By Steven L. Sellnow, Soil Conservation Service

Fieldwork by Steven L. Sellnow and Tom E. McCarty,
Soil Conservation Service

United States Department of Agriculture,
Soil Conservation Service,
in cooperation with
New Mexico Agricultural Experiment Station

MORA COUNTY AREA is in the northeastern part of New Mexico. It extends from the eastern edge of the Sangre de Cristo Mountains eastward to the Canadian River. It includes most of Mora County. The total area is 1,133,960 acres, or 1,771 square miles. According to a recent estimate, the population of Mora County is 4,150. The population of Mora, the county seat, is about 900, and the population of the Mora Valley is about 2,800. The population of Wagon Mound, the largest town in the eastern part of the survey area, is about 870. It was named for a prominent point along the Santa Fe Trail that resembles a covered wagon (fig. 1).

The western part of the survey area is in the Sangre de Cristo Mountains. It is characterized by many drainageways that extend from high mountains to lower, broad mountain valleys (fig. 2). Small irrigated farms are common in the mountain valleys. Most of the mountains and foothills are covered with coniferous forests. The eastern part of the area is characterized by undulating to steep uplands and is dominantly rangeland. Cow-calf and steer operations on large ranches are the major agricultural land uses. The highest point in the survey area, nearly 11,600 feet, is at Gascon Point, on the western boundary of the area. The lowest point, about 5,000 feet, is near the Canadian River.

The survey area is joined by Colfax County on the north, Harding County on the east, San Miguel County on the south, and Taos County on the west.

The western part of the survey area is served by the Western Mora Soil and Water Conservation District, and the eastern part is served by Mora-Wagon Mound Soil and Water Conservation District. Both districts were organized in 1941.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

General Nature of the Survey Area

This section briefly discusses the history and development; climate; physiography, relief, and drainage; water supply; and agriculture of the survey area.

History and Development

The earliest inhabitants in the survey area were various tribes of native American Indians. Spanish explorers visited the area in the 1500's, and Hispanic settlers followed.

In the early 1800's, fur traders and trappers from the east ventured into the area. They were mainly interested in beaver and buffalo pelts. This was a major reason for the development of the famed Santa Fe Trail, which

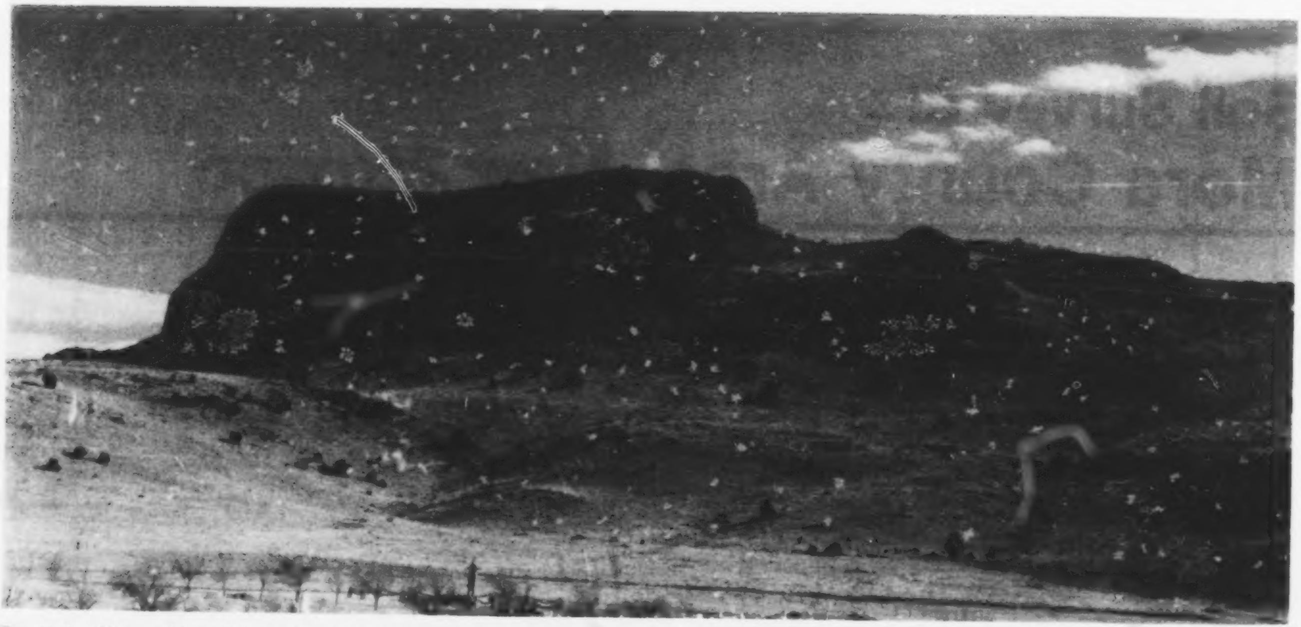

Figure 1.—Wagon Mound, a landmark along the historical Santa Fe Trail, in an area of Argiustolls-Rock outcrop complex, extremely steep.

extends from Missouri to Santa Fe, New Mexico, and passes through the survey area.

Because of the instability of the area, Fort Union was established in 1851 along the Santa Fe Trail. This fort provided a stopping place for travelers and protection for early settlers. As the railroad gradually replaced travel on the Santa Fe Trail, Fort Union was abandoned. For 40 years it was a large military outpost in the southwest; however, it is maintained today as a national monument by the National Park Service.

Mora County was originally established by an act of the Territorial Legislature in 1860, and it consisted of nearly 4,000 square miles. It later was divided by legislation and parts of the original area were included in Colfax, Harding, and San Miguel Counties.

Climate

By Frank E. Houghton, climatologist for New Mexico, National Weather Service.

The climate of the survey area is semiarid, except in the mountains. Temperatures generally are cool because of the high elevation, but wide ranges in annual and diurnal temperatures occur. Sunshine is plentiful, and humidity is relatively low. Most of the precipitation is the result of air circulating generally clockwise over the Gulf of Mexico, around the Bermuda high-pressure area. The largest amount of rainfall, nearly one-half of the average annual, occurs in July and August. Nearly 80 percent of the average annual precipitation occurs in May through October. In winter, the main source of moisture is the Pacific Ocean; much of the precipitation from storms moving toward the east falls in the mountains to the west. Only small amounts of precipitation, averaging less than 0.50 inch per month, fall on the plains in winter.

Data on temperature and precipitation as recorded at Levy are shown in table 1. The data generally are representative of the central and eastern parts of the survey area. The average annual precipitation generally increases with elevation. It is nearly 15 inches on the plains, 16 to 20 inches in the central parts of the area, and more than 25 inches in the Sangre de Cristo Mountains. About 36 days a year receive 0.10 inch or more of precipitation, of which 12 receive 0.50 inch or more.

Precipitation varies widely from year to year and month to month. The total annual precipitation at Optimo was 33.47 inches in 1941 and only 4.49 inches in 1956. The total precipitation in August at Gascon was 12.72 inches in 1961 and only 0.34 inch in 1962.

The average annual snowfall ranges from 2 to 3 feet in the eastern and central parts of the survey area and from 5 to 6 feet or more in the mountains. Snowfall in the valley occasionally exceeds 10 inches in 24 hours, but usually there is only short term accumulation on the ground. More than 100 inches of snow fell in the 1967-68 season, 42 inches of which fell in March.

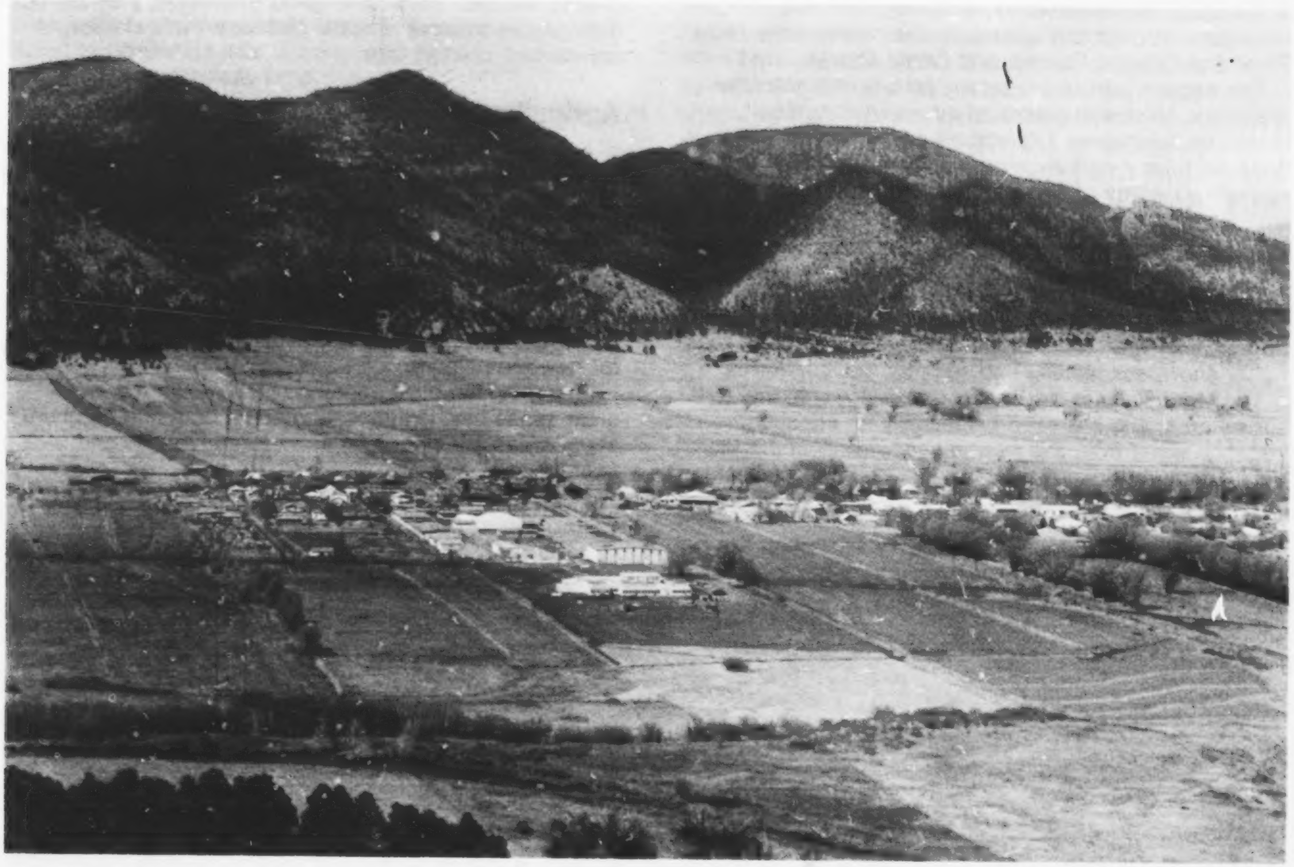

Figure 2.—View of Mora, the county seat, in Mora Valley.

The average annual temperature ranges from 53 degrees F in the southeastern part of the area to 43 degrees or lower in the mountains. The average temperatures generally decrease 3 to 4 degrees for each increase in elevation of 1,000 feet. Approximately one-half of the year has freezing temperatures, and an average of 12 to 30 days have temperatures of as much as 90 degrees. Temperatures of 100 degrees are rare, and several days in a year may have subzero temperatures. The highest temperature recorded in the county was 101 degrees at Valmora on July 24, 1963, and the lowest was -35 degrees at Valmora on January 13, 1963.

The freeze-free period, from mid-May to early in October, is nearly 140 days in most of the survey area. In the high mountain areas, however, the freeze-free period is only about 90 days (June through August).

The sun shines about 70 percent of the time possible throughout the year, or an average of almost 3,100 hours. The average annual windspeed is about 12 miles per hour, but it averages about 15 miles per hour during the windy period in spring. Winds from the southwest are dominant, but the direction may vary locally because of topography. Because of the cool temperatures, relative humidity is moderately high. It is almost 75 percent early in the morning and about 35 percent in the afternoon.

Hail may accompany some of the more severe thunderstorms in summer, but it seldom causes much damage. Very few tornadoes occur; however, the most destructive tornado in New Mexico struck at Wagon Mound on May 31, 1930.

Physiography, Relief, and Drainage

The mountainous, western part of the survey area is characterized by narrow valleys at higher elevations connected by drainageways to broader valleys at lower elevations. These drainageways form the major streams in the area. The major streams flowing from the mountains through the uplands to the east are the Mora River and Cebolla, Coyote, and Ocate Creeks.

The eastern part of the survey area is characterized by undulating to steep uplands of extensive rangeland dissected by shallow, intermittent drainageways that become deeper as they near the Canadian River, at the eastern boundary of the area (fig. 3).

Water Supply

Waterflow in the rivers and other drainageways varies greatly in the survey area from season to season and from year to year. Most of the runoff is the result of the winter snowpack melting and summer thunderstorms.

The Mora River is the largest drainageway in the survey area, and it is used extensively for irrigation. Irrigation water from this river is used mainly in the Mora Valley and Watrous areas. Cebolla, Coyote, and Ocate Creeks are also used for irrigation; however, they are not dependable sources of water because the waterflow is unreliable.

Agriculture

The land in the survey area shows much evidence of extensive farming in the past. Much of the farming was nonirrigated; during the droughts of the 1930's, therefore, most of the farms were abandoned. Nearly all of these farmed areas have revegetated naturally to native plants or have been shaped and seeded. Very little nonirrigated farming is practiced in the survey area today. Most of the nonirrigated crops grown are grasses for hay and pasture.

Presently, the main irrigated crops grown are small grain, grass hay, legumes, and some corn and sorghum. Many areas are also used as irrigated hayland and pastureland.

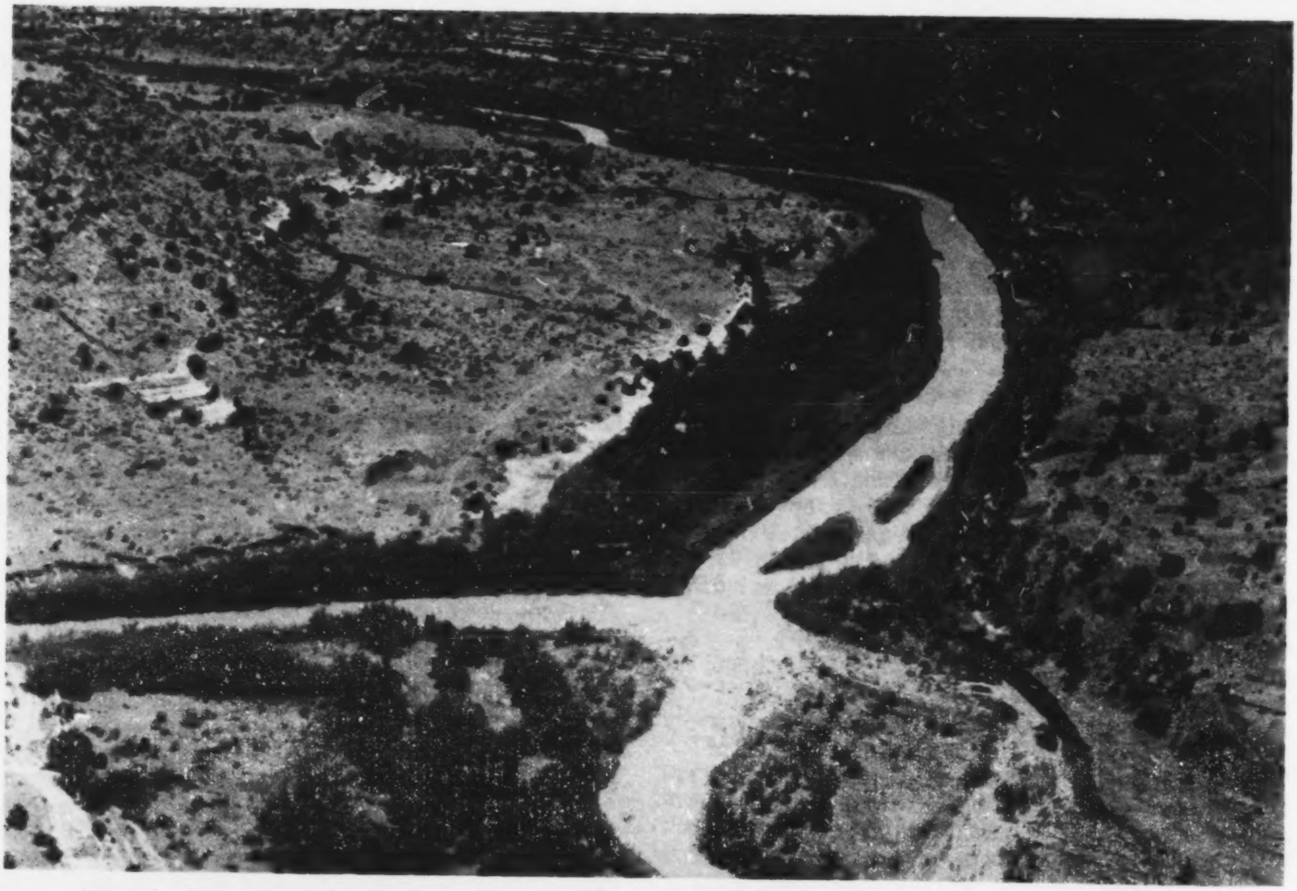

Figure 3.—Aerial view of Canadian River Canyon, showing an area of Haplustolls-Rock outcrop complex, extremely steep.

Christmas trees are a major part of the economy in the survey area. Many of the soils in the Mora Valley are suited to Christmas tree farming, and there is much interest in this specialty crop.

How This Survey Was Made

This survey was made to provide information about the soils or miscellaneous areas in the survey area. The information includes a description of the soils or miscellaneous areas and their location and a discussion of the suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils or miscellaneous areas in the survey area occur in an orderly pattern that is related to the geology, the landforms, relief, climate, and the natural vegetation of the area. Each kind of soil or miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils or miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge gradually into one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties in terms of expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

Map Unit Descriptions

1. Colmor-Swastika-Mion

Shallow and deep, nearly level to very steep, well drained soils; on upland side slopes, hills, and ridges

This map unit is mainly in the north-central and northeastern parts of the survey area. It is characterized by upland side slopes, hills, and ridges. The side slopes are nearly level to gently sloping and are broad and rounded in shape. The more steeply sloping hills are generally long and narrow and encompass small mesa tops. The upland side slopes and hills are dissected by narrow to broad, flat areas in drainageways.

Slope is 0 to 45 percent. The vegetation is mainly grass and oneseed juniper with an understory of grass and brush. Elevation is 5,800 to 7,200 feet. The average annual precipitation is about 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit makes up about 16 percent of the survey area. It is about 38 percent Colmor and similar soils, 19 percent Swastika and similar soils, and 13 percent Mion and similar soils. Included in the remaining 30 percent are Karde, Litle, Penrose, Penrose Variant, and Vermejo soils and Rock outcrop.

Colmor soils are on upland side slopes. These soils are deep and well drained. They formed in moderately fine textured material derived dominantly from shale. The surface layer is brown and dark grayish brown loam. The subsoil is dark grayish brown, brown, and pale brown loam and silty clay loam. The substratum to a depth of 60 inches or more is light gray and very pale brown loam.

Swastika soils are on upland side slopes. These soils are deep and well drained. They formed in fine textured residuum derived dominantly from shale. The surface layer is dark grayish brown silt loam. The subsoil is dark grayish brown and brown clay loam, silty clay loam, and silty clay. The substratum to a depth of 60 inches or more is light yellowish brown silt loam.

Mion soils are on hills and along ridges. These soils are shallow and well drained. They formed in fine textured material derived dominantly from shale. The surface layer is grayish brown silty clay loam. The underlying layer to a depth of 15 inches is light olive brown clay over weathered shale. Weathered shale is at a depth of 10 to 20 inches.

Of minor extent in this unit are moderately well drained and deep Vermejo soils in wide, flat areas in drainageways and on dry lakebeds; well drained Karde soils on the leeward sides of lakes and potholes; well drained and moderately deep Litle soils on the lower, less steeply sloping hillsides; and well drained and shallow Penrose and Penrose Variant soils on small mesa tops and on the upper part of hillsides; and Rock outcrop. Rock outcrop is mainly shale and limestone in the form of ledges, sheets, and vertical escarpments.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, recreation, and urban development. Some areas are used for irrigated or nonirrigated cropland.

This unit is well suited to livestock grazing. The main limitations are low, unreliable precipitation and steepness of slope in the hilly areas. Overgrazing is a major concern of management because it increases the hazards of soil blowing and gullying and results in an increase in undesirable plants. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion.

This unit provides habitat that is used primarily by grassland wildlife such as pronghorn antelope, blacktailed jackrabbit, and horned lark. Areas of shallow soils and Rock outcrop support woody plants that provide habitat for various other wildlife species. The availability of water limits the number of wildlife in the unit.

2. Partri-Carnero-Crews

Shallow to deep, nearly level to gently sloping, well drained soils; on upland side slopes, on low hills, and along ridges

This map unit is in the south-central and southeastern parts of the survey area. It is characterized by nearly level to gently sloping uplands with small caliche crests dissected by shallow drainageways. The upland side slopes are broad and rounded in shape. The caliche crests are remnants of the Ogallala Formation and are broad and nearly level to undulating. The drainageways are long and narrow.

Slope ranges from 0 to 30 percent but is mainly 0 to 8 percent. The vegetation is mainly grass. Elevation ranges from 5,000 to 8,500 feet but is mainly 5,500 to 7,500 feet. The average annual precipitation is about 14 to 18 inches, the average annual air temperature ranges from 44 to 52 degrees F but is mainly 48 to 52 degrees, and the average frost-free period ranges from 90 to 160 days but is mainly 140 to 160 days.

This unit makes up about 19 percent of the survey area. It is about 42 percent Partri and similar soils, 10 percent Carnero and similar soils, 10 percent Crews and similar soils, and 9 percent Bernal and similar soils. Included in the remaining 29 percent are La Brier, Lavata Variant, Manzano, Remunda, Tinaja, and Tricon soils.

Partri soils are on upland side slopes. These soils are deep and well drained. They formed in mixed alluvium derived from limestone, sandstone, and basalt. The surface layer is brown loam. The subsoil is brown clay loam, silty clay loam, and clay. The substratum to a depth of 60 inches or more is light brown and pink gravelly loam.

Carnero soils are in slightly convex areas on upland side slopes and along low hills and ridges. These soils are moderately deep and well drained. They formed in residuum derived dominantly from sandstone and modified with eolian material. The surface layer is brown loam. The subsoil is brown and reddish brown loam in the upper part and ranges to silty clay and clay in the lower part. Unweathered sandstone is at a depth of 28 inches.

Crews soils are in undulating areas along the ridges and crests. These soils are shallow and well drained. They formed in mixed eolian sediment derived from local sources. The surface layer is brown silt loam. The subsoil is brown clay loam. Indurated caliche is at a depth of 14 inches.

Bernal soils are along ridges, crests, and drainageways on uplands. These soils are shallow and well drained. They formed in residuum derived from sandstone and modified with eolian material. The surface layer is brown loam. The subsoil is brown and reddish brown sandy clay loam. Unweathered sandstone is at a depth of 19 inches.

Of minor extent in this unit are well drained and deep La Brier and Manzano soils in swales and drainageways, Remunda and Lavate Variant soils on side slopes in the Rainsville area, Tinaja soils on terrace remnants, and well drained and moderately deep Tricon soils on undulating uplands near areas of the Crews soils.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, recreation, and urban development. Some areas are used for irrigated or nonirrigated cropland.

This unit is well suited to livestock grazing. The main limitations are low, unreliable precipitation and shallow soil depth. Overgrazing is a major concern of management because it increases the hazards of soil blowing and gullying and results in an increase in undesirable plants. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion.

This unit consists of extensive grasslands that lack the diversity and distribution of habitat to support varied kinds of wildlife. Characteristic animals include pronghorn antelope and horned lark. The unit is hunted by wintering hawks. Tree growth along drainageways is important to the wildlife.

3. Rock outcrop-Sombordoro-Bernal

Rock outcrop, and shallow, moderately sloping to very steep, well drained soils; on upland benches, along ridges, and on sides of shallow to deep canyons and escarpments

This map unit is in the south-central and southeastern parts of the survey area and adjacent to the Canadian River escarpments. It is characterized by moderately sloping to very steep areas of sandstone dissected by shallow to deep drainageways. Areas of this unit commonly are long and narrow in shape.

Slope is 3 to 45 percent. The vegetation is mainly pinyon and oneseed juniper with an understory of Gamble oak and grass. Elevation is 5,500 to 7,500 feet. The average annual precipitation is about 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit makes up about 11 percent of the survey area. It is about 30 percent Rock outcrop, 30 percent Sombordoro and similar soils, and 17 percent Bernal and similar soils. Included in the remaining 23 percent are Tuloso and Carnero soils.

Rock outcrop is mainly exposed sandstone with interbedded shale and is in the form of ledges, sheets, and vertical escarpments.

Sombordoro soils are on upland benches, on canyonsides, and along ridges. These soils are shallow and well drained. They formed in mixed material derived dominantly from sandstone and shale. The surface layer is brown very stony sandy loam. The subsoil is reddish brown very stony sandy clay. Hard red sandstone is at a depth of 14 inches.

Bernal soils are along ridges and crests and in drainageways on uplands. These soils are shallow and well drained. They formed in residuum derived dominantly from sandstone and modified with eolian material. The surface layer is brown loam. The subsoil is brown and reddish brown sandy clay loam. Unweathered sandstone is at a depth of 19 inches.

Of minor extent in this unit are shallow Tuloso soils on benches and canyon sides and along ridges and moderately deep Carnero soils on slightly convex positions. Also included are deep, well drained soils in narrow valleys, swales, and drainageways.

This unit is used for livestock grazing, wildlife habitat, and watershed and as a source of firewood and fenceposts. Some areas are used for urban development.

If this unit is used for livestock grazing, the main limitations are steepness of slope, which limits accessibility by livestock, and variable understory production in areas dominated by pinyon and oneseed juniper. Steepness of slope causes overgrazing of the less steeply sloping areas in the unit. Overgrazing is a major concern of management because it increases the risks of water erosion and gullying and promotes an increase of undesirable plants. The included soils in narrow valleys, swales, and drainageways are major forage producers in this unit. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

If this unit is used as a source of firewood or fenceposts, the main limitations are steepness of slope, Rock outcrop, and the variable density of desirable species.

This unit supports productive stands of woody plants that provide suitable habitat for mule deer, wood rat, and scrub jay. If properly managed, this habitat can provide important nesting areas for a variety of birds.

4. Rock outcrop-Haplustolls-Argiustolls

Rock outcrop, and shallow to deep, very steep to extremely steep, well drained soils; on benches, ridges, and escarpments, on side slopes in deeply cut sandstone canyons, and on the edges of basalt-capped mesas in areas of basalt flows

This map unit is in the eastern and southern parts of the survey area, on the escarpments of the Canadian and Mora Rivers, and in the central and north-central parts, on escarpments in areas of basalt flows. It is characterized by very steep and extremely steep escarpments dissected by deeply cut drainageways and very steep and extremely steep escarpments on the edges of basalt mesas. Areas of this unit commonly are long and narrow in shape.

Slope is 30 to 65 percent. The vegetation is mainly brush, shrubs, and grass with an overstory of scattered oneseed juniper and some pinyon in a few areas. Elevation is 5,500 to 7,500 feet. The average annual precipitation is about 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit makes up about 3 percent of the survey area. It is about 32 percent Rock outcrop, 26 percent Haplustolls, and 14 percent Argiustolls. Included in the remaining 28 percent are Ayon, Barela, Sombordoro, Tuloso, and Yankee soils and Eutroboralfs.

Rock outcrop in this unit is mainly sandstone with thin shale strata along the Mora and Canadian Rivers, and it is mainly basalt in the central part of the survey area. It is in the form of ridges and vertical escarpments.

Haplustolls are on benches and side slopes in deeply cut sandstone canyons. These soils are extremely variable in their characteristics. They are shallow to deep and are well drained. They formed in mixed materials derived dominantly from sandstone and shale. The surface layer is brown very stony sandy loam. The next layer is stratified, dark grayish brown and grayish brown very cobbly sandy loam and very cobbly loam. The substratum is brown extremely cobbly sandy clay loam.

Argiustolls are on benches and on the sides of basalt-capped mesas and canyon walls in areas of basalt flows. These soils are extremely variable in their characteristics. They are moderately deep to deep and are well drained. They formed in alluvium, colluvium, and residuum derived dominantly from basalt. The surface layer is dark grayish brown stony silt loam. The subsoil is brown and pale brown silty clay and gravelly clay loam. Unweathered basalt is at a depth of 45 inches.

Of minor extent in this unit are Barela and Yankee soils and Eutroboralfs near the edge of delineations at the higher elevations and Ayon, Sombordoro, and Tuloso soils near the edge of delineations at the lower elevations.

This unit is used for wildlife habitat, as watershed, and for livestock grazing in the less sloping areas.

If this unit is used for livestock grazing, the main limitations are steepness of slope, Rock outcrop, and stones and cobbles on the surface. The included soils in less sloping areas are major forage producers in this unit. Steepness of slope causes overgrazing of the less sloping areas.

This unit has a low potential to support wildlife unless livestock grazing is limited. If the vegetation is in good condition, it can provide important wintering range for mule deer. Malpais hills that support oak brush furnish important feeding areas for mule deer. Introduced Barbary sheep occupy areas of this unit along the Canadian River.

5. Apache-Rock outcrop-Ayon

Shallow and deep, nearly level to moderately steep, well drained soils, and Rock outcrop; on mesas, low vertical escarpments, and side slopes and along ridges in areas of basalt flows

This map unit is in the central and north-central parts of the survey area. It is characterized by basalt flows dissected by shallow drainageways with a few cinder cones and craters throughout the area. Areas of this unit commonly are broad and irregular in shape.

Slope is 1 to 30 percent. The vegetation is mainly grass. Elevation is 6,500 to 7,400 feet. The average annual precipitation is about 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit makes up about 10 percent of the survey area. It is about 45 percent Apache and similar soils, 17 percent Rock outcrop, and 17 percent Ayon and similar soils. Included in the remaining 21 percent are Capulin, Pidineen, Charette, and Tricon soils.

Apache soils are on mesas and side slopes and along ridges. These soils are shallow and well drained. They formed in residuum derived dominantly from basalt and modified with eolian material. The upper part of the surface layer is dark grayish brown very stony loam, and the lower part is dark grayish brown stony heavy loam. The subsoil is dark grayish brown stony clay loam. Unweathered basalt is at a depth of 13 inches.

Rock outcrop is basalt in the form of ridges, sheets, and short vertical escarpments.

Ayon soils are on mesas and side slopes. These soils are deep and well drained. They formed in alluvium and colluvium derived dominantly from basalt. The surface layer is dark grayish brown stony loam. The next layer is grayish brown stony loam. The substratum to a depth of 60 inches or more is white and very pale brown very stony to extremely stony loam.

Of minor extent in this unit are deep Capulin and Charette soils in concave areas, shallow Pidineen soils on uplands and mesas, and moderately deep Tricon soils on uplands.

This unit is used for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

If this unit is used for livestock grazing, the main limitations are Rock outcrop and stones and cobbles on the surface. Overgrazing is a major concern of management because it causes hazards of water erosion and gullying and an increase of undesirable plants. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

This unit provides grassland habitat that exhibits little diversity and is low in production. In years of high runoff or abundant moisture in spring, an excellent growth of forbs improves the habitat, particularly that for pronghorn antelope.

6. Capulin-Charette

Deep, nearly level to gently sloping, well drained soils; on side slopes in areas of basalt flows

This map unit is in the central and north-central parts of the survey area. It is characterized by lower alluvial side slopes and broad alluvial valleys in areas of basalt flows. Areas of this unit are generally broad and rounded in shape.

Slope is 0 to 8 percent. The vegetation is mainly grass. Elevation is 6,500 to 7,500 feet. The average annual precipitation is about 14 to 18 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 140 to 160 days.

This unit makes up about 9 percent of the survey area. It is about 40 percent Capulin soils, 23 percent Charette soils, 9 percent Ayon soils, and 9 percent Torreon soils. Included in the remaining 19 percent are Apache, La Brier, and Thunderbird soils and Rock outcrop.

Capulin soils are on slightly convex, lower side slopes. These soils are deep and well drained. They formed in alluvial material derived dominantly from basalt and modified with eolian material. The surface layer is brown loam. The subsoil is brown and light yellowish brown silty clay loam and clay loam. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Charette soils are on slightly concave, lower side slopes. These soils are deep and well drained. They formed in alluvial sediment derived dominantly from basalt and modified with eolian material. The surface layer is brown loam. The subsoil to a depth of 70 inches or more is brown and yellowish brown loam, clay loam, and sandy clay loam.

Of minor extent in this unit are deep Ayon soils, shallow Apache soils, areas of Rock outcrop, deep La Brier soils in swales, and deep Torreon soils and moderately deep Thunderbird soils on side slopes and low hills in the vicinity of Maxson Crater.

This unit is used for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

This unit is well suited to livestock grazing. Overgrazing is a major concern of management because it increases the risks of soil blowing and gullying and promotes an increase of undesirable plants. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

This unit supports only a limited number of wildlife species. Scattered small canyons, drainageways, and stands of shrubs provide most of the habitat for the wildlife. There is seasonal use of the unit by insect- and seed-eating birds such as horned lark, meadowlark, lark bunting, and cassin sparrow.

7. Dargol-Rock outcrop-Vamer

Shallow to deep, gently sloping to very steep, well drained soils, and Rock outcrop; on mountainsides, mesas, ridges, benches, foothills, peaks, and side slopes

This map unit is in the western part of the survey area and in the Turkey Mountains, in the central part of the survey area. It is characterized by lower mountainsides and foothills covered with coniferous trees and dissected by narrow drainageways leading to broader, open mountain valleys at the edge of the unit. Areas of this unit commonly are broad and irregular in shape.

Slope is 5 to 65 percent. The vegetation is mainly coniferous trees with an understory of grass. Pinyon, juniper, shrubs, and brush are in some areas. Elevation is 7,200 to 9,000 feet. The average annual precipitation is about 16 to 24 inches, the average annual air temperature is 38 to 46 degrees F, and the average frost-free period is 85 to 110 days.

This unit makes up about 15 percent of the survey area. It is about 20 percent Dargol and similar soils, 15 percent Rock outcrop, 15 percent Vamer and similar soils, 14 percent Rocio and similar soils, and 10 percent Eutroboralfs. Included in the remaining 26 percent are Firo, Fuera, Hesperus, and Krakon soils.

Dargol soils are on mountainsides and mesas and along ridges. These soils are moderately deep and well drained. They formed in fine textured residuum derived dominantly from shale and sandstone. The surface is covered with a mat of forest litter 1 inch thick. The surface layer is grayish brown stony loam. The subsurface layer is brown stony loam. The subsoil is light brown clay. Hard reddish sandstone that has thin strata of shale is at a depth of 27 inches.

Rock outcrop is mainly exposed sandstone and interbedded shale in some areas. It is in the form of ledges, sheets, peaks, and vertical escarpments.

Vamer soils are on ridges, mesas, benches, and side slopes. These soils are shallow and well drained. They formed in old sediment derived dominantly from sandstone and shale. The surface is covered with a mat of forest litter 1 inch thick. The surface layer is dark grayish brown stony loam. The subsoil is brown and light yellowish brown clay loam and clay. Hard yellowish brown sandstone is at a depth of 16 inches.

The Rocio soils are on convex mountainsides. They are deep and well drained. They formed in material derived dominantly from sandstone and shale. The surface layer is dark grayish brown stony loam. The subsurface layer is brown stony loam. The subsoil to a depth of 65 inches or more is brownish yellow and light yellowish brown clay.

Eutroboralfs are extremely variable in their characteristics. They are on mountainsides, foothills, and benches. They are shallow to deep and are well drained.

Of minor extent in this unit are deep Fuera soils on mountainsides, deep Hesperus soils on valley sides, shallow Firo soils on mountainsides and foothills and along ridges and peaks, and shallow Krakon soils on the lower, convex part of mountainsides and on foothills.

This unit is used for livestock grazing, wildlife habitat, watershed, recreation, and woodland. Some areas are used for urban development.

If this unit is used for livestock grazing, the main limitations are steepness of slope, Rock outcrop, and stones on the surface. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

If this unit is used as woodland, the main limitations are very steep and extremely steep slopes, Rock outcrop, and stones on the surface, which interfere with logging operations. The main concerns in producing and harvesting timber are seedling mortality, equipment use, and a hazard of erosion.

This unit provides large areas of important yearlong habitat for mule deer and wild turkey. Elk use the unit as winter range. With the proper management of livestock and protection from wildfire, the unit has a high potential for use as habitat for wildlife.

8. Moreno-Brycan-Hesperus

Deep, nearly level to moderately sloping, well drained soils; in alluvial mountain valleys and on the lower part of alluvial mountainsides

This map unit is in mountain valleys in the western part of the survey area (fig. 4). It is characterized by long and narrow alluvial valleys at higher elevations connected by drainageways to broader valleys at lower elevations.

Slope is 1 to 15 percent. The vegetation is mainly grass with invasions of coniferous trees and brush near some edges of the unit. Elevation ranges from 6,500 to 9,000 feet but is mainly 7,200 to 9,000 feet. The average annual precipitation ranges from 14 to 20 inches but is mainly about 16 to 20 inches, the average annual air temperature ranges from 42 to 48 degrees F but is mainly 42 to 46 degrees, and the average frost-free period ranges from 85 to 140 days but is mainly 85 to 110 days.

This unit makes up about 4 percent of the survey area. It is about 28 percent Moreno and similar soils, 26 percent Brycan and similar soils, and 19 percent Hesperus and similar soils. Included in the remaining 27

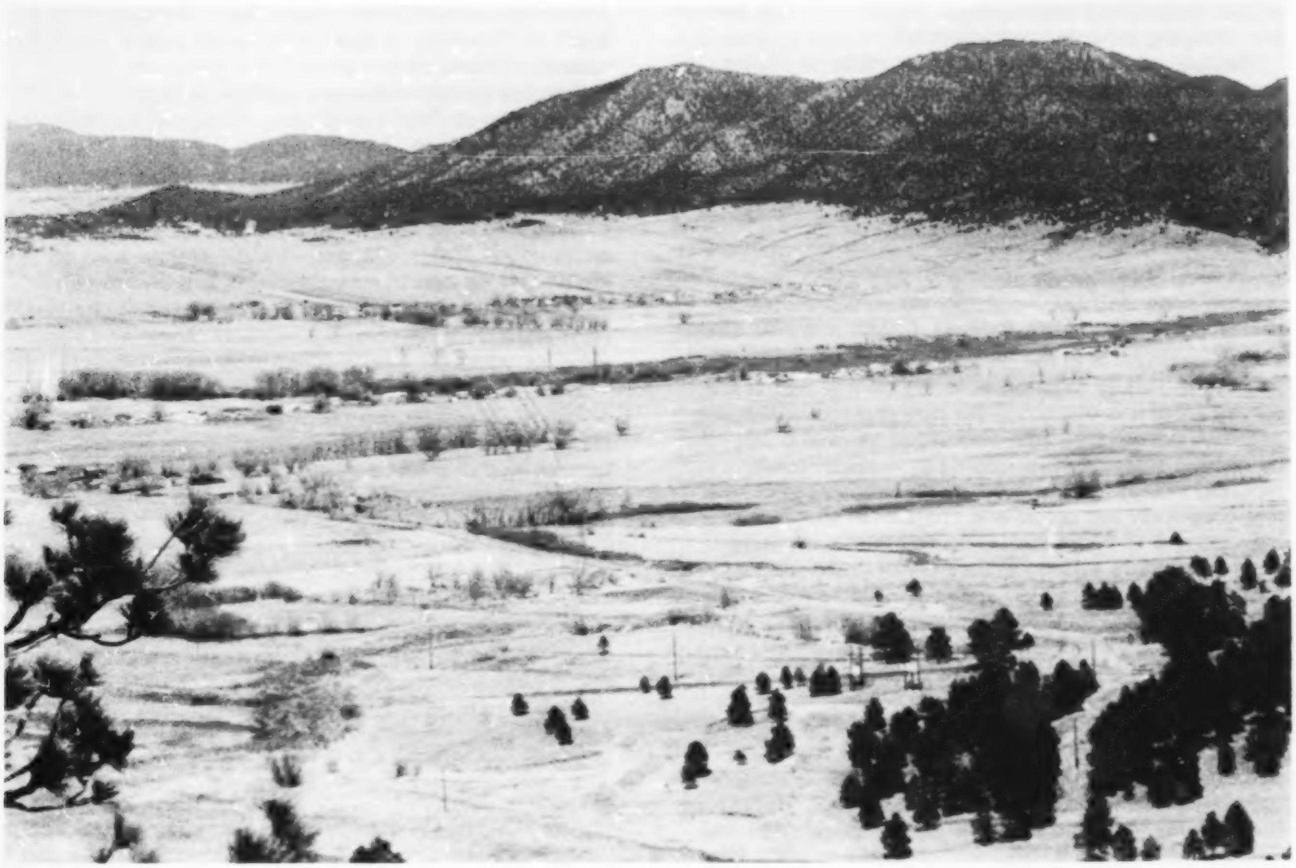

Figure 4.—Area of general map unit 8.

percent are Ceboya, Breece Variant, Holman, La Brier, Manzano, Remunda, and Kinesava soils.

Moreno soils are in alluvial mountain valleys. These soils are deep and well drained. They formed in fine textured alluvial sediment derived dominantly from sandstone and shale. The surface layer is brown loam. The subsoil is brown and reddish brown clay loam and clay. The substratum to a depth of 60 inches or more is brown clay loam.

Brycan soils are in alluvial mountain valleys. These soils are deep and well drained. They formed in alluvial material derived dominantly from sandstone and shale. The surface layer is brown loam. The subsoil is dark brown and brown loam and clay loam. The substratum to a depth of 60 inches or more is brown loam.

Hesperus soils are on the lower part of alluvial mountainsides and in alluvial mountain valleys. These soils are deep and well drained. They formed in alluvial sediments derived from metamorphic and sedimentary rocks. The surface layer is brown sandy loam. The subsoil is brown clay loam or sandy clay loam. The substratum to a depth of 64 inches or more is light brown sandy clay loam.

Of minor extent in this unit are deep, very poorly drained Ceboya soils on flood plains, excessively drained Holman soils on flood plains and bench terraces, well drained La Brier and Manzano soils in swales at lower elevations, well drained Kinesava soils in alluvial mountain valleys, somewhat excessively drained Breece Variant soils on convex alluvial fans, well drained Remunda soils near the edge of delineations at lower elevations, and extremely variable Ustifluvents along drainageways on flood plains.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and recreation. Some areas are used as irrigated or nonirrigated cropland and for urban development.

Overgrazing is a major concern of management because it increases the risks of water erosion and gullying and promotes an increase of undesirable plants. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management. Because of the runoff this unit receives from adjacent areas and because of the included very poorly drained soils, grazing should be delayed until the soils in this unit are firm and can withstand trampling by livestock.

Many houses and other structures have been constructed on the minor soils on flood plains. These areas are subject to frequent flooding during periods of high rainfall and runoff.

If this unit is used as irrigated or nonirrigated cropland, the main limitations are the hazard of water erosion and lack of a dependable water supply.

This unit was historically the winter range for elk. Development of agricultural and urban uses has reduced the value of the unit to terrestrial wildlife species. The streams, streambank bushes, and seasonally flooded lowlands of this unit provide desirable habitat for some wildlife.

9. Raton-Barela-Yankee

Shallow to deep, nearly level to very steep, well drained soils; in valleys and on side slopes, ridges, benches, and mesas in areas of basalt flows

This map unit is in the west-central and north-central parts of the survey area. It is characterized by mesas, valleys, and side slopes dissected by shallow to deep drainageways in areas of basalt flows. Areas of this unit commonly are broad and irregular in shape.

Slope is 0 to 40 percent. The vegetation is mainly grass in the valleys and on the side slopes and coniferous trees on the mesas and mountainsides. Elevation is 7,400 to 11,000 feet. The average annual precipitation is about 16 to 22 inches, the average annual air temperature is 40 to 46 degrees F, and the average frost-free period is 80 to 110 days.

This unit makes up about 10 percent of the survey area. It is about 26 percent Raton and similar soils, 20 percent Barela and similar soils, 17 percent Yankee and similar soils, and 13 percent Dalcan and similar soils. Included in the remaining 24 percent are Burnac, Hillery, Saladon, and Spud soils.

Raton soils are on basalt-capped mesas, ridges, and side slopes. These soils are shallow and well drained. They formed in residuum derived dominantly from basalt. The surface layer is brown very cobbly loam. The subsoil is brown very stony silty clay. Hard basalt is at a depth of 12 inches.

Barela soils are on benches and side slopes in areas of basalt flows. These soils are deep and well drained. They formed in residuum derived from basalt. The surface layer is brown loam. The upper part of the subsoil is reddish brown loam, clay loam, and silty clay, and the lower part is reddish brown stony clay loam. Hard basalt is at a depth of 45 inches.

Yankee soils are on valley sides and side slopes in areas of basalt flows. These soils are deep and well drained. They formed in alluvium derived dominantly from basalt and modified with eolian material. The upper part of the surface layer is dark grayish brown loam, and the lower part is brown loam. The subsoil is reddish brown clay loam and silty clay. The substratum to a depth of 60 inches or more is reddish brown clay loam.

The Dalcan soils are on basalt capped mesas and side slopes. These soils are moderately deep and well drained. They formed in residuum derived dominantly from basalt. The surface layer is dark brown cobbly loam. The subsoil is dark brown and brown very cobbly clay loam and very cobbly clay. Hard basalt is at a depth of 28 inches.

Of minor extent in this unit are deep Burnac and Spud soils on mountainsides, deep Hillery soils on high mesa tops, very poorly drained Saladon soils in depressional areas and swales, and Rock outcrop in the form of ledges, ridges, and vertical escarpments.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, woodland, and recreation. Some areas are used for urban development.

The soils in valleys provide a major part of the forage for livestock in this unit. Areas of the less sloping wooded soils also provide some grazable understory. Overgrazing is a major concern of management because it increases the risks of water erosion and gullying and promotes an increase of undesirable plants. Grazing should be delayed until the soils in this unit are dry and firm and can support trampling by livestock. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

If this unit is used for timber production, the main limitations are steepness of slope, areas of Rock outcrop, and cobbles on the surface. The main concerns in producing and harvesting timber are equipment use, seedling mortality, and the hazards of windthrow and erosion.

This unit provides a wide diversity of habitat that is capable of supporting large populations of wildlife. The mountain valleys and streambank vegetation are important parts of the habitat. The wooded areas provide excellent habitat for mule deer and winter habitat for elk.

10. Etoe-Etown-Maes

Deep, undulating to extremely steep, well drained soils; on mountainsides and benches

This map unit is in the extreme western part of the survey area. It is characterized by undulating to extremely steep mountainsides dissected by narrow drainageways.

Slope is 5 to 70 percent. The vegetation is mainly coniferous trees. Elevation is 8,000 to 11,600 feet. The average annual precipitation is about 18 to 30 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is 40 to 90 days.

This unit makes up about 3 percent of the survey area. It is about 43 percent Etoe and similar soils, 20 percent Etown and similar soils, and 16 percent Maes and similar soils. Included in the remaining 21 percent are Cundiyo and Nambe Variant soils, Rock outcrop, and Rubble land.

Etoe soils are on benches and mountainsides. These soils are deep and well drained. They formed in alluvial and colluvial material derived dominantly from sandstone and shale. The surface is covered with a mat of undecomposed and decomposed forest litter 2 inches thick. The surface layer is light brownish gray cobbly fine sandy loam. The subsurface layer is pale brown cobbly loam and cobbly fine sandy loam. The subsoil to a depth of 60 inches or more is yellowish brown and brown very cobbly loam and extremely cobbly loam.

Etown soils are on mountainsides. These soils are deep and well drained. They formed in alluvial and colluvial material derived dominantly from sandstone and shale. The surface is covered with a mat of decomposing and decomposed forest litter 3 inches thick. The surface layer is dark grayish brown gravelly loam. The subsurface layer is pinkish gray very gravelly loam. The subsoil to a depth of 60 inches or more is light brown and reddish yellow very gravelly clay loam and extremely gravelly clay.

Maes soils are on mountainsides and benches. These soils are deep and well drained. They formed in mixed materials derived dominantly from sandstone and shale. The surface is covered with a mat of decomposing forest litter 2 inches thick. The surface layer is dark grayish brown very cobbly loam. The subsurface layer is light yellowish brown very cobbly sandy loam. The subsoil to a depth of 60 inches or more is pale brown, yellow, and brownish yellow very cobbly loam and very cobbly sandy clay.

Of minor extent in this unit are Cundiyo and Nambe Variant soils on very steep and extremely steep mountainsides at higher elevations, Rock outcrop in the form of ledges, sheets, ridges, and vertical escarpments, and Rubble land on very steep and extremely steep mountainsides.

This unit is used as woodland, wildlife habitat, and watershed and for recreation. Some areas are used for urban development.

If this unit is used for timber production, the main limitations are very steep and extremely steep slopes, Rock outcrop, Rubble land, and cobbles on the surface. The main concerns in producing and harvesting timber are equipment use, seedling mortality, and the hazards of windthrow and erosion.

This unit provides habitat for blue grouse, black bear, red squirrel, and other forest life. Many species of songbirds nest in this unit. Protection from wildfire is essential to preserving the wildlife habitat.

Detailed Soil Map Units

The map units delineated on the detailed maps at the back of this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most inclusions and miscellaneous areas have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or require different management. These are contrasting, or dissimilar inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all of the soils or miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Moreno loam, 3 to 8 percent slopes, is one of several phases in the Moreno series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Apache-Rock outcrop complex, moderately sloping, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Partri-Carnero-Bernal association, undulating, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example. Miscellaneous areas are shown on the maps. Some that are too small to be shown are identified by a special symbol on the maps.

This survey was mapped at two levels of detail. At the most detailed level, map units are narrowly defined. This means that map unit boundaries were plotted and verified at closely spaced intervals. The soils in areas of irrigated and nonirrigated cropland and in urban areas were mapped at this level. At the less detailed level, map units are broadly defined. Boundaries were plotted and verified at wider intervals. The soils in areas of rangeland and woodland were mapped at this level. In the map legend, narrowly defined units are indicated by symbols in which the first letter is a capital and the second is a lower case. For broadly defined units, the first and second letters are capitals.

Table 2 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

AA—Apache-Ayon complex, gently sloping. This map unit is on basalt-capped mesas in areas of basalt flows. Slope is 1 to 8 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 17 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit is 45 percent Apache cobbly silt loam, 1 to 8 percent slopes, and 30 percent Ayon stony loam, 2 to 8 percent slopes. The Apache soil is on ridges and near the edges of mesa tops, and the Ayon soil is on side slopes and near the edges of mesa tops. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Charette and Capulin soils in slightly concave areas, Pidineen soils in slightly elevated areas and on ridges, Thunderbird and Torreon soils in swales and concave areas in the vicinity of Maxson Crater, Rock outcrop near areas of the Apache soil and along low ridges, and soils that are scattered throughout the unit and are similar to the Ayon soil but have bedrock at a depth of 20 to 40 inches. Included areas make up about 25 percent of the total acreage.

The Apache soil is shallow and well drained. It formed in residuum derived from basalt and modified with eolian material. Typically, the surface layer is dark grayish brown cobbly silt loam 3 inches thick. The subsoil is dark brown cobbly loam 6 inches thick. The substratum is brown cobbly loam 3 inches thick over hard basalt.

Permeability of the Apache soil is moderate. Available water capacity is very low. Effective rooting depth is 5 to 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Ayon soil is deep and well drained. It formed in alluvial and colluvial deposits derived dominantly from basalt. Typically, the surface layer is dark grayish brown stony loam 3 inches thick. The next layer is grayish brown stony loam 15 inches thick. The upper 6 inches of the substratum is white very stony loam, and the lower part to a depth of 60 inches or more is very pale brown extremely stony loam.

Permeability of the Ayon soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly little bluestem, blue grama, western wheatgrass, big bluestem, sideoats grama, and indiangrass. As the potential natural plant community deteriorates, western wheatgrass, big bluestem, and indiangrass decrease and there is an increase in blue grama, threeawn, and ring muhly, which normally occur in small amounts in the potential natural plant community. Grazing management should be designed to increase the productivity and reproduction of western wheatgrass, sideoats grama, and big bluestem.

This unit has limited suitability for rangeland management practices such as rangeland seeding because of the included areas of Rock outcrop and the cobbles and stones on the surface. Use of practices that facilitate rangeland management such as installation of pipelines for providing stock water and fences is difficult because of the included areas of Rock outcrop and shallow depth to basalt. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines, and tanks.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 650 pounds in unfavorable years.

This unit is poorly suited to recreational development. The main limitations of the Apache soil are cobbles on the surface and shallow depth to basalt. The main limitations of the Ayon soil are stones on the surface and dustiness during dry periods.

This unit is poorly suited to urban development. The main limitations are stones and cobbles on the surface and in the soils and shallow depth to basalt in the Apache soil.

AB—Apache-Rock outcrop complex, moderately sloping. This map unit is on the sides of basalt flows. Slope is 3 to 15 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 17 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit is 45 percent Apache very stony loam, 3 to 15 percent slopes, and 35 percent Rock outcrop (fig. 5). The Apache soil is on side slopes and along ridges, and Rock outcrop occurs as ridges, sheets, and short vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

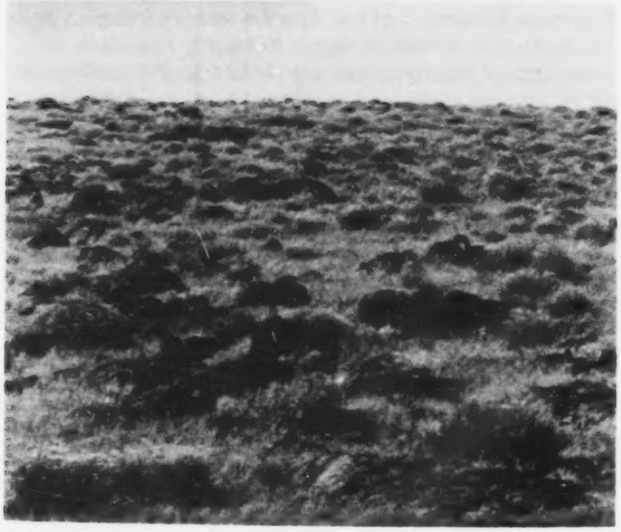

Figure 5.—Area of Apache-Rock outcrop complex, moderately sloping.

Included in this unit are small areas of Ayon soils that are on side slopes and are intermingled with the Apache soil, La Brier soils on the bottom of a few scattered potholes, Pidineen soils in slightly elevated areas and on ridges near the edges of mapped areas, Charette soils in swales and concave areas, and Torreon soils in swales and in slightly concave areas in the vicinity of Maxson Crater. Also included in this unit are some small volcanic cinder cones. Included areas make up about 20 percent of the total acreage.

The Apache soil is shallow and well drained. It formed in residuum derived from basalt and modified with eolian material. Typically, the upper 3 inches of the surface layer is dark grayish brown very stony loam and the lower 4 inches is dark grayish brown stony loam. The subsoil is dark grayish brown stony clay loam 6 inches thick. Unweathered basalt is at a depth of 13 inches.

Permeability of the Apache soil is moderate. Available water capacity is very low. Effective rooting depth is 5 to 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of basalt that supports little if any vegetation.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly sideoats grama, little bluestem, blue grama, mountain muhly, and western wheatgrass. As the potential natural plant community deteriorates, sideoats grama, little bluestem, mountain muhly, and western wheatgrass decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, broom snakeweed, and fringe sagewort increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, mountain muhly, and western wheatgrass.

This unit is poorly suited to such rangeland management practices as rangeland seeding and mechanical brush management because of the shallow depth to bedrock and the areas of Rock outcrop. Use of practices that facilitate rangeland management such as installation of fences and pipelines for providing stock water is difficult because of the shallow depth to bedrock. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,600 pounds per acre in favorable years to 800 pounds in unfavorable years.

This unit is poorly suited to recreational development. The main limitations are stones on the surface and the areas of Rock outcrop.

This unit is poorly suited to urban development. The main limitations are stones on the surface and in the soil, shallow depth to bedrock, and the areas of Rock outcrop.

AC—Apache-Rock outcrop-Ayon complex, moderately steep. This map unit is on mesas on and around the edge of basalt flows. Slope is 10 to 30 percent. Areas generally are long and narrow in shape and are 40 to 640 acres in size. The native vegetation is mainly grass and scattered areas of oak. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 17 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit is 45 percent Apache cobbly loam, 10 to 15 percent slopes, 20 percent Rock outcrop, and 20 percent Ayon very stony loam, 10 to 30 percent slopes. The Apache soil is along ridges and near the edge of the tops of mesas; the Rock outcrop occurs as sheets, ridges, and short vertical escarpments; and the Ayon soil is near the edge of the tops of mesas and on side slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Argiustolls on the steeper side slopes; Charette soils in swales and drainageways; Pidineen soils on the edge of the tops of mesas and intermingled with the Apache soil; and Yankee, Raton, and Barela soils near the edge of mapped areas at the higher elevations. Also included in this unit are some small volcanic cinder cones. Included areas make up about 15 percent of the total acreage.

The Apache soil is shallow and well drained. It formed in residuum derived from basalt and modified with eolian material. Typically, the surface layer is dark brown cobbly loam 3 inches thick. The subsoil is dark brown cobbly clay loam 10 inches thick. Basalt is at a depth of 13 inches.

Permeability of the Apache soil is moderate. Available water capacity is very low. Effective rooting depth is 5 to 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of basalt that supports little if any vegetation.

The Ayon soil is deep and well drained. It formed in alluvial and colluvial deposits derived dominantly from basalt. Typically, the surface layer is dark brown very stony loam 6 inches thick. The next layer is dark brown very stony loam 6 inches thick. The substratum to a depth of 60 inches or more is gray extremely stony loam.

Permeability of the Ayon soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on the Apache soil is mainly sideoats grama, little bluestem, blue grama, and western wheatgrass. As the potential natural plant community deteriorates, sideoats grama, little bluestem, and western wheatgrass decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase.

The potential natural plant community on the Ayon soil is mainly blue grama, sideoats grama, little bluestem, and big bluestem. As the potential natural plant community deteriorates, these plants decrease and there is an increase in ring muhly, threeawn, Gambel oak, and oneseed juniper, which normally occur in small amounts in the potential natural plant community. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, little bluestem, western wheatgrass, and big bluestem.

Slope limits access by livestock, which results in overgrazing of the less sloping areas of this unit. The unit is poorly suited to such rangeland management practices as rangeland seeding and mechanical brush management because of slope and the areas of Rock outcrop. Use of practices that facilitate rangeland management such as installation of fences and pipelines for providing stock water is difficult because of the areas of Rock outcrop and shallow depth to basalt. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,400 pounds per acre in favorable years to 650 pounds in unfavorable years.

This unit is poorly suited to recreational development. The main limitations of the Apache soil are cobbles on the surface and shallow depth to basalt. The main limitations of the Ayon soil are stones on the surface and slope.

This unit is poorly suited to urban development. The main limitations are shallow depth to basalt, stones and cobbles on the surface and in the soils, and slope.

AR—Argiustolls-Rock outcrop complex, extremely steep. This map unit is on the edges of basalt-capped mesas and on canyon walls in areas of basalt flows. Slope is 30 to 75 percent. Areas are long and narrow in shape and are 40 to 640 acres in size. The native vegetation is mainly grass and scattered oak brush. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit is 45 percent Argiustolls stony silt loam, 30 to 65 percent slopes, and 30 percent Rock outcrop. The Argiustolls are on benches and side slopes, and Rock outcrop occurs as ridges, sheets, and steep vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of highly calcareous, deep soils on side slopes and benches, Apache and Ayon soils on the tops of small mesas and near the edge of mapped areas, and Yankee, Raton, and Barela soils near the edge of mapped areas at the higher elevations. Included areas make up about 25 percent of the total acreage.

The Argiustolls are extremely variable in their characteristics. They are moderately deep to deep and are well drained. They formed in alluvial, colluvial, and residual material derived dominantly from basalt. No single profile is typical, but one commonly observed in the survey area has a surface layer of dark grayish brown stony silt loam 10 inches thick. The upper 21 inches of the subsoil is brown and pale brown silty clay, and the lower 14 inches is brown gravelly clay loam. Brownish weathered basalt is at a depth of 45 inches.

Permeability of the Argiustolls are very slow to moderate. Available water capacity is low to high. Effective rooting depth is 28 to 60 inches or more. Runoff is very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is slight.

Rock outcrop is exposed areas of basalt that supports little if any vegetation.

This unit is used mainly for wildlife habitat and watershed. The less sloping areas are also used for some livestock grazing. Some areas are used for recreation and urban development.

The included Apache, Ayon, Charette, Yankee, Raton, and Barela soils receive extra runoff from adjacent areas in this unit and are in the less sloping areas; therefore, these soils have the potential to be major forage producers in the unit.

The potential natural plant community on this unit is mainly little bluestem, blue grama, sideoats grama, and big bluestem. As the potential natural plant community deteriorates, little bluestem, sideoats grama, and big bluestem decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, oneseed juniper, and Gambel oak increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of big bluestem and sideoats grama.

This unit has limited suitability for rangeland management practices because of the areas of Rock outcrop and slope. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited. Mechanical treatment is not practical because of the stony surface and slope. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,200 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is poorly suited to recreation and urban development. It is limited mainly by stones on the surface, the areas of Rock outcrop, and slope.

BA—Barela-Yankee association, gently sloping. This map unit is on mesas, side slopes, and valley sides in areas of basalt flows. Slope is 0 to 9 percent. Areas are broad or elongated in shape and are 50 to 1,000 acres in size. The native vegetation is mainly grass. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 40 percent Barela loam, 3 to 9 percent slopes, and 40 percent Yankee loam, 0 to 5 percent slopes (fig. 6). The Barela soil is on the upper side slopes, and the Yankee soil is on the lower side slopes and valley sides.

Included in this unit are small areas of Dalcan soils in the steeper areas and near the edge of mapped areas, Hillery soils near the edge of mapped areas at the higher elevations, Raton soils and Rock outcrop along ridges, and Saladon soils in a few potholes in the unit. Included areas make up about 20 percent of the total acreage.

The Barela soil is deep and well drained. It formed in residuum derived from basalt. Typically, the surface layer is brown loam 3 inches thick. The upper 8 inches of the subsoil is reddish brown loam, the next 15 inches is reddish brown clay loam and silty clay, and the lower 19 inches is reddish brown stony clay loam. Hard basalt is at a depth of 45 inches.

Permeability of the Barela soil is slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Yankee soil is deep and well drained. It formed in alluvium derived dominantly from basalt and modified with some eolian material. Typically, the upper part of the surface layer is dark grayish brown loam 4 inches thick and the lower 8 inches is brown loam. The upper 6 inches of the subsoil is reddish brown clay loam, and the lower 32 inches is reddish brown silty clay. The substratum to a depth of 60 inches or more is reddish brown clay loam.

Permeability of the Yankee soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly Arizona fescue, mountain muhly, prairie junegrass, western wheatgrass, little bluestem, and oatgrass. As the potential natural plant community deteriorates, the desirable forage plants such as Arizona fescue, mountain muhly, prairie junegrass, and oatgrass decrease and there is an increase in ring muhly, rabbitbrush, blue grama, pingue, cinquefoil, and sagewort, which normally occur in small amounts in the potential natural plant community. Sleepygrass and Kentucky bluegrass readily invade.

Grazing management should be designed to increase the vigor, productivity, and reproduction of Arizona fescue, prairie junegrass, and oatgrass. Grazing should be delayed until the soil in this unit is firm and the more

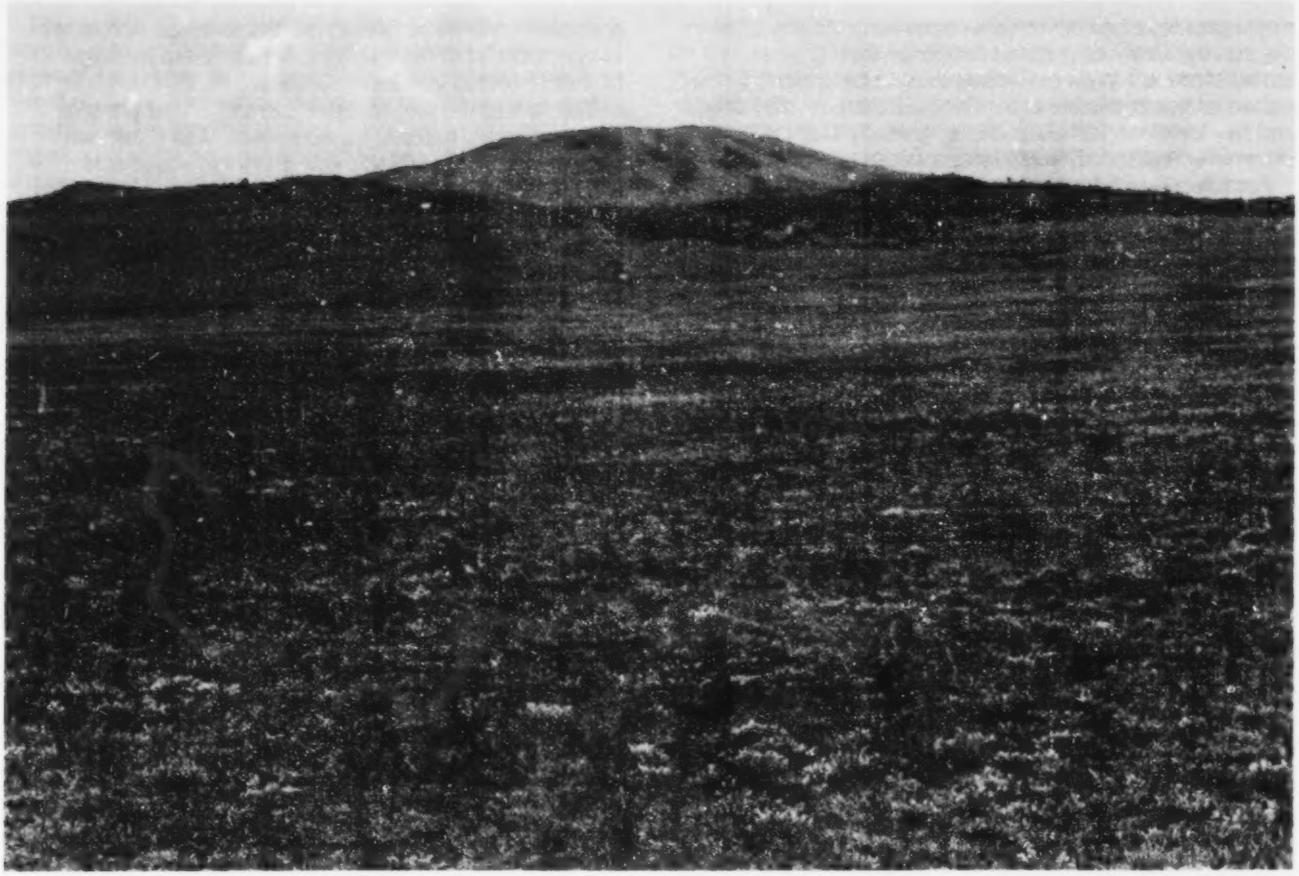

Figure 6.—Area of Barela-Yankee association, gently sloping, in foreground; cinder cone in center background.

desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as mechanical brush management and rangeland seeding. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain muhly, western wheatgrass, and prairie junegrass. Pingue, cinquefoil, and rabbitbrush can be controlled by hand operations or by chemicals.

Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suitable on the Yankee soil. The Barela soil is limited for livestock watering ponds and other water impoundments because of bedrock at a depth of 40 to 60 inches. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,800 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is well suited to recreational development. It has few limitations.

This unit is suited to urban development. The main limitations of the Barela soil are a high shrink-swell potential during alternate periods of wetting and drying and basalt at a depth of 40 to 60 inches. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

BC—Bernal-Rock outcrop-Carnero complex, moderately sloping. This map unit is along ridges and drainageways and on side slopes. Slope is 3 to 15 percent. Areas are irregular in shape and are 40 to 320 acres in size. The native vegetation is mainly grass and scattered brush and shrubs in some areas. Elevation is

5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 45 percent Bernal loam, 3 to 15 percent slopes, 30 percent Rock outcrop, and 15 percent Carnero loam, 3 to 5 percent slopes. The Bernal soil is on benches and upper side slopes, Rock outcrop occurs as sheets, ledges, and short vertical escarpments, and the Carnero soil is on the lower part of side slopes and in the more nearly level, slightly convex areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Lavate Variant, Partri, and Remunda soils on the lower, slightly concave side slopes; Manzano soils in swales and drainageways; and Bernal stony loam and Sombordoro and Tuloso soils scattered throughout the unit. The Lavate Variant and Remunda soils are in the Rainsville area. Included areas make up about 10 percent of the total acreage.

The Bernal soil is shallow and well drained. It formed in residuum derived from sandstone and modified with eolian material. Typically, the surface layer is dark brown loam 3 inches thick. The upper 3 inches of the subsoil is brown sandy clay loam, and the lower 8 inches is brown clay loam. Hard red sandstone that is fractured in the upper 2 inches is at a depth of 14 inches.

Permeability of the Bernal soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 19 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is mainly exposed areas of sandstone that supports little if any vegetation.

The Carnero soil is moderately deep and well drained. It formed in residuum derived from sandstone and modified with eolian material. Typically, the surface layer is brown loam 6 inches thick. The upper 11 inches of the subsoil is reddish brown silty clay loam, and the lower 13 inches is reddish brown silty clay. Hard, red sandstone is at a depth of 30 inches.

Permeability of the Carnero soil is slow. Available water capacity is low. Effective rooting depth is 25 to 35 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The included Lavate Variant, Partri, Remunda, and Manzano soils receive extra runoff from adjacent higher lying areas of the unit; therefore, these soils have the potential to be major forage producers in the unit.

The potential natural plant community on the Bernal soil is mainly sideoats grama, little bluestem, blue grama, and New Mexico feathergrass. As the potential natural plant community deteriorates, these plants decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as threeawn, ring muhly, broom snakeweed, and oneseed juniper increase. Loss of the surface layer results in a severe decrease in productivity and in the potential of the Bernal soil to produce plants suitable for grazing.

The Bernal soil has limited suitability for such rangeland management practices as rangeland seeding and mechanical brush management because of slope and the areas of Rock outcrop. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and drinking troughs is difficult because of the shallow depth to bedrock in the Bernal soil and the areas of Rock outcrop.

The potential natural plant community on the Carnero soil is mainly blue grama, western wheatgrass, sideoats grama, bottlebrush squirreltail, and galleta. As the potential natural plant community deteriorates, these plants decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase and cholla, oneseed juniper, and sleepygrass invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass and sideoats grama.

The Carnero soil is suited to such rangeland management practices as rangeland seeding, installation of fences and pipelines for providing stock water, and mechanical brush management; however, use of these practices may be difficult because of the complex pattern of occurrence of this soil in the unit. Cholla and oneseed juniper can be controlled by hand operations or by chemicals. The Carnero soil is limited for livestock watering ponds and other water impoundments because of the bedrock at a depth of 25 to 35 inches.

Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Bernal soil ranges from 1,100 pounds per acre in favorable years to 400 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Carnero soil ranges from 1,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

The Bernal soil is poorly suited to recreational development. It is limited mainly by shallow depth to bedrock. The Carnero soil is suited to recreational development. It is limited mainly by slope and the bedrock at a depth of 25 to 35 inches.

The Bernal soil is poorly suited to urban development. The main limitations are shallow depth to bedrock and slope. The Carnero soil is suited to urban development. It is limited mainly by the bedrock at a depth of 25 to 35 inches and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

Bd—Breece Variant sandy loam, 3 to 8 percent slopes. This deep, somewhat excessively drained soil is on convex alluvial fans near outlets of mountain drainageways. It formed in alluvial sediment derived from metamorphic rock. Areas are irregular in shape and are 5 to 100 acres in size. The native vegetation is mainly grass and scattered areas of conifers. Elevation is 7,400 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the upper 3 inches of the surface layer is brown sandy loam and the lower 7 inches is dark grayish brown sandy loam. The subsoil is brown sandy loam 8 inches thick. The upper 12 inches of the substratum is yellowish brown sandy loam, and the lower part to a depth of 60 inches or more is brown sandy loam.

Included in this unit are small areas of Brycan, Ceboya, Hesperus, Kinesava, and Moreno soils near the edge of mapped areas; Dargol and Firo soils and Eutroboralfs near the edge of mapped areas at the higher elevations; and Holman soils and Ustifluvents in areas adjacent to drainageways. Included areas make up about 25 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Breece Variant soil is moderately rapid. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and nonirrigated cropland. The main crop is grass hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly prairie junegrass, pine dropseed, big bluestem, mountain muhly, needlegrass, sideoats grama, and blue grama with an overstory of scattered ponderosa pine. As the density of the canopy cover increases or the understory plant community deteriorates, prairie junegrass, pine dropseed, big bluestem, and mountain muhly decrease and there is an increase in ponderosa pine, blue grama, and sagewort. In some areas dense stands of ponderosa pine have become established. A limited wood crop can be produced in these areas if proper woodland management is used.

Grazing management should be designed to increase the productivity and reproduction of prairie junegrass, big bluestem, and mountain muhly. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

This unit has limited suitability for rangeland management practices such as mechanical brush management and rangeland seeding because of the hazard of soil blowing. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, and tanks. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 1,800 pounds per acre in favorable years to 1,300 pounds in unfavorable years.

If this unit is used for nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. The unit is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the unit from soil blowing and water erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Terracing and contour farming reduce runoff and the risk of water erosion and help to conserve moisture.

This unit has limited suitability for Christmas tree production. The main limitation is the high hazard of soil blowing. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees require pruning yearly to form a dense, conical shape. Scotch pine is suited to Christmas tree production on this unit.

This unit is suited to recreational development. It is limited mainly by the hazard of soil blowing and slope.

This unit is suited to urban development. It is limited mainly by the seepage potential of the sandy loam subsoil and substratum.

Be—Brycan loam, 1 to 3 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in alluvial material derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 50 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 85 to 100 days.

Typically, the surface layer is brown loam 8 inches thick. The upper 12 inches of the subsoil is dark brown loam, the next 13 inches is dark brown clay loam, and the lower 9 inches is brown loam. The substratum to a depth of 60 inches or more is brown loam.

Included in this unit are small areas of Ceboya soils on flood plains near the edge of mapped areas, Hesperus soils scattered throughout the unit, Holman soils and Ustifluvents in areas adjacent to drainageways, Kinesava soils in slightly depressional areas, and Moreno soils in the steeper areas near the edge of mapped areas. Included areas make up about 20 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Brycan soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are annual hay crops, pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly mountain muhly, Arizona fescue, mountain brome, pine dropseed, and western wheatgrass. As the potential natural plant community deteriorates, the desirable forage plants such as mountain brome, Arizona fescue, and pine dropseed decrease and there is an increase in blue grama, cinquefoil, sagebrush, and pingue, which normally occur in small amounts in the potential natural plant community. Sleepygrass and Kentucky bluegrass readily invade.

Grazing management should be designed to increase the vigor, productivity, and reproduction of Arizona fescue, mountain brome, and mountain muhly. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as rangeland seeding and mechanical treatment. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain brome, and western wheatgrass. Cinquefoil and sagebrush can be controlled by hand operations or by chemicals. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds is suitable on this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 2,400 pounds per acre in favorable years to 1,400 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and erosion.

The water table in this unit is at a depth of more than 6 feet under normal conditions. Irrigation water should be applied carefully to prevent the buildup of a high water table. Seepage from irrigation ditches can also contribute to a rise in the level of the water table. Line ditches or install irrigation pipelines to reduce water loss by seepage.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is well suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilization helps to maintain or increase yields. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphorus.

This unit is suited to Christmas tree production. The main limitation is the hazard of erosion when the soil is bare during planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees require pruning yearly to form a dense, conical shape. Trees suited to Christmas tree production on this unit are blue spruce and white fir.

This unit is well suited to recreation and urban development. It has few limitations.

Bf—Brycan loam, 3 to 8 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in alluvial material derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 50 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 85 to 100 days.

Typically, the surface layer is brown loam 15 inches thick. The subsoil is dark brown sandy clay loam 35 inches thick. The substratum to a depth of 60 inches or more is brown sandy clay loam.

Included in this unit are small areas of Dargol soils in the steeper areas near the edge of mapped areas, Hesperus soils scattered throughout the unit, Holman soils and Breece Variant soils in areas adjacent to drainageways, Kinesava soils in the lower lying, concave areas, and Moreno soils near the edge of mapped areas. Included areas make up about 25 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Brycan soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly Arizona fescue, mountain muhly, prairie junegrass, needlegrass, little bluestem, oatgrass, and western wheatgrass. As the potential natural plant community deteriorates, the desirable forage plants such as Arizona fescue, prairie junegrass, and oatgrass decrease and there is an increase in blue grama, ring muhly, cinquefoil, pingue, Gambel oak, and sagewort, which normally occur in small amounts in the potential natural plant community. Sleepygrass and Kentucky bluegrass readily invade.

Grazing management should be designed to increase the vigor, productivity, and reproduction of Arizona fescue, prairie junegrass, and oatgrass. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as rangeland seeding and mechanical brush management. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain muhly, and prairie junegrass. Cinquefoil, Gambel oak, and sagewort can be controlled by chemical, mechanical, or hand operations. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds is suitable on this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 1,800 pounds per acre in favorable years to 1,000 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and erosion.

The water table in this unit is at a depth of more than 6 feet under normal conditions. Irrigation water should be applied carefully to prevent the buildup of a high water table. Seepage from irrigation ditches can also contribute to a rise in the level of the water table. Line ditches or install irrigation pipelines to reduce water loss by seepage.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum. Terracing and contour farming reduce runoff and the risk of erosion and help to conserve moisture. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Fertilization helps to maintain or increase yields. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

This unit is suited to Christmas tree production. The main limitation is a hazard of water erosion when the soil is left bare during planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees require pruning yearly to form a dense, conical shape. Trees suited to Christmas tree production on this unit are blue spruce and white fir.

This unit is well suited to recreation and urban development. It is limited mainly by slope.

BH—Burnac-Hillery association, hilly. This map unit is on basalt mesas. Slope is 5 to 25 percent. Areas are broad and rounded in shape and are 150 to 640 acres in size. The native vegetation is mainly conifers, aspen, and grass. Elevation is 8,200 to 11,000 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is less than 90 days.

This unit is 45 percent Burnac stony loam, 5 to 25 percent slopes, and 35 percent Hillery stony loam, 5 to 15 percent slopes. The Burnac soil is in the steeper wooded areas, and the Hillery soil is in the less sloping grassed areas.

Included in this unit are small areas of Dargol soils near the edge of mapped areas at the lower elevations, Raton and Dalcan soils near the edge of mapped areas, Saladon soils in swales and in the few potholes in the unit, and Spud soils and Rock outcrop scattered throughout the unit. Included areas make up about 20 percent of the total acreage.

The Burnac soil is deep and well drained. It formed in residuum derived from basalt. Typically, the surface layer is very dark grayish brown stony loam 7 inches thick. The subsurface layer is dark grayish brown stony loam 8 inches thick. The subsoil is reddish brown clay and silty clay 25 inches thick. The substratum is reddish brown stony silty clay 10 inches thick over basalt.

Permeability of the Burnac soil is very slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Hillery soil is deep and well drained. It formed in fine textured residuum derived from basalt. Typically, the surface layer is dark brown stony loam 8 inches thick. The upper 6 inches of the subsoil is reddish brown cobbly clay loam, and the lower 26 inches is reddish brown and brown cobbly silty clay. The substratum to a depth of 60 inches or more is reddish brown cobbly silty clay.

Permeability of the Hillery soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, livestock grazing, and watershed. Some areas are used for recreation and urban development.

The Burnac soil is suited to scattered stands of aspen and bristlecone pine. Remnants of white fir and Englemann spruce are scattered among the aspen stands. The site index for aspen ranges from 52 to 53. On the basis of a site index of 52, this soil can produce approximately 6 cords of aspen per acre per year.

This unit has few limitations for producing and harvesting timber. Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. Conventional methods of harvesting timber can be used. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

The potential understory vegetation on the Burnac soil is mainly Thurber fescue, mountain brome, Arizona fescue, and a variety of forbs. The potential natural plant community on the Hillery soil is mainly mountain brome, Thurber fescue, mountain muhly, Arizona fescue, and needlegrass. As the potential natural plant community deteriorates, the desirable forage plants such as mountain brome, Thurber fescue, and Arizona fescue decrease and there is an increase in dandelion, cinquefoil, lupine, iris, and sagewort, which normally occur in small amounts in the potential natural plant community. Kentucky bluegrass and quaking aspen readily invade.

Grazing management should be designed to increase the productivity and reproduction of mountain brome, Thurber fescue, and Arizona fescue. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

The Hillery soil has limited suitability for rangeland management practices such as rangeland seeding and mechanical brush management because of the areas of Rock outcrop scattered throughout the unit and stones on the surface. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and watering facilities is difficult on this unit because of the areas of Rock outcrop, stones on the surface, and slope in some areas. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, and tanks.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry understory vegetation on the Burnac soil ranges from 800 pounds per acre in favorable years to 200 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Hillery soil ranges from 1,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by stones on the surface and slope.

The Burnac soil is poorly suited to urban development. It is limited mainly by bedrock at a depth of 40 to 60 inches or more, stones on the surface and in the profile, and a high shrink-swell potential during alternate periods of wetting and drying. The Hillery soil is poorly suited to urban development. It is limited mainly by stones on the surface and in the profile and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

CA—Capulin-Charette-Ayon association, gently sloping. This map unit is on side slopes in areas of basalt flows. Slope is 2 to 8 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit is 60 percent Capulin loam, 2 to 8 percent slopes; 15 percent Charette loam, 2 to 4 percent slopes; and 15 percent Ayon stony loam, 2 to 8 percent slopes. The Capulin soil is in the slightly convex, steeper areas, the Charette soil is in the slightly concave, less sloping areas, and the Ayon soil is in areas that are similar to those occupied by the Capulin soil and are near the edge of mapped areas.

Included in this unit are small areas of Apache soils and Rock outcrop near the edge of mapped areas, along ridges, and adjacent to drainageways; La Brier soils in swales and in the few scattered potholes in the unit; and Yankee and Barela soils near the edge of mapped areas at the higher elevations. Included areas make up about 10 percent of the total acreage.

The Capulin soil is deep and well drained. It formed in alluvial material derived dominantly from basalt and modified with eolian material. Typically, the surface layer is dark brown loam 3 inches thick. The upper 16 inches of the subsoil is brown loam, and the lower 6 inches is light brown loam. The upper 10 inches of the substratum is pink loam, and the lower part to a depth of 60 inches or more is pink cobbly loam.

Permeability of the Capulin soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Charette soil is deep and well drained. It formed in alluvial sediment derived dominantly from basalt and modified with eolian material. Typically, the surface layer is brown loam 3 inches thick. The upper 12 inches of the subsoil is brown clay loam and silty clay loam, and the lower 35 inches is brown and dark brown clay and silty clay. The substratum to a depth of 60 inches or more is light brown silty clay loam.

Permeability of the Charette soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Ayon soil is deep and well drained. It formed in alluvial and colluvial deposits derived dominantly from basalt. Typically, the surface layer is brown stony loam 13 inches thick. The next layer is brown very stony silt loam 7 inches thick. The substratum to a depth of 60 inches or more is light brown and white very stony loam.

Permeability of the Ayon soil is moderate. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on the Capulin and Charette soils is mainly blue grama, western wheatgrass, sideoats grama, and galleta. As the potential natural plant community deteriorates, western wheatgrass, sideoats grama, and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as threeawn, ring muhly, and buffalograss increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass and sideoats grama.

The Capulin and Charette soils are suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, sideoats grama, and blue grama. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds is suitable on these soils.

The potential natural plant community on the Ayon soil is mainly blue grama, little bluestem, western wheatgrass, big bluestem, and sideoats grama. As the potential natural plant community deteriorates, western wheatgrass, big bluestem, and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as threeawn, ring muhly, and broom snakeweed increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, big bluestem, and little bluestem.

The Ayon soil is poorly suited to such rangeland management practices as rangeland seeding and mechanical treatment because of stones on the surface. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and livestock watering facilities is difficult on the Ayon soil because of rock fragments in the soil profile and the seepage potential.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Capulin and Charette soils ranges from 1,500 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Ayon soil ranges from 1,600 pounds per acre in favorable years to 650 pounds in unfavorable years.

The Capulin soil is well suited to recreational development. It is limited mainly by dustiness during extended dry periods. The Charette soil is well suited to recreational development. It has few limitations. The Ayon soil is poorly suited to recreational development. It is limited mainly by dustiness and large stones on the surface. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

The Capulin soil is well suited to urban development. It is limited mainly by a potential for seepage in the cobbly loam substratum. The Charette soil is suited to urban development. It is limited mainly by a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The Ayon soil is poorly suited to urban development. It is limited mainly by stones on the surface and in the soil.

Cb—Ceboya silty clay loam, 0 to 1 percent slopes. This deep, very poorly drained soil is on broad mountain valley flood plains along major drainageways (fig. 7). It formed in fine textured alluvial sediment of mixed origin. Areas are broad and irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly water tolerant sedges and grasses. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface is covered with a mat of dense sod of decomposing plant material and fibrous roots 1 inch thick. The upper 9 inches of the surface layer is very dark gray silty clay loam, and the lower 5 inches is very dark grayish brown silty clay loam. The upper 9 inches of the substratum is dark grayish brown silty clay loam, the next 18 inches is dark gray silty clay, and the lower part to a depth of 60 inches or more is dark gray clay.

Included in this unit are small areas of Brycan, Hesperus, Kinesava, Moreno, and Breece Variant soils near the edge of mapped areas and Holman soils and Ustifluvents adjacent to drainageways. Included areas make up about 10 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Ceboya soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is ponded during rainfall, and the hazard of water erosion is none. The hazard of soil blowing is slight. Frequent periods of flooding can occur during May through September. A fluctuating water table is at a depth of 0 to 3 feet.

Most areas of this unit are used for livestock grazing, urban development, wildlife habitat, and watershed. A few areas are used for grass hay, pasture, and recreation.

The potential natural plant community on this unit is mainly tufted hairgrass, Nebraska sedge, mountain brome, western wheatgrass, red fescue, and bulrush. As the potential natural plant community deteriorates, the desirable forage plants such as tufted hairgrass, Nebraska sedge, mountain brome, and red fescue decrease and there is an increase in Baltic rush, iris, western yarrow, and cinquefoil, which normally occur in small amounts in the potential natural plant community. Dandelions and introduced grasses such as timothy, redtop, and Kentucky bluegrass readily invade.

Grazing management should be designed to increase the vigor, productivity, and reproduction of tufted hairgrass, mountain brome, and red fescue. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Maximum forage production can be achieved by mowing and harvesting the plants for hay.

Use of mechanical treatment practices is not practical because of frequent periods of flooding and the fluctuating water table. This unit has limited suitability for rangeland management practices such as rangeland seeding and installation of pipelines for providing stock water and watering facilities because of frequent periods of flooding and the fluctuating water table.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry vegetation on this unit ranges from 3,200 pounds per acre in favorable years to 1,800 pounds in unfavorable years.

This unit is poorly suited to hay and pasture. Frequent periods of flooding can occur as a result of rainfall and runoff. Wetness limits the choice of plants that can be grown and the period of cutting and grazing. Excessive water on the surface can be removed by drainage systems; however, drainage systems have limited benefit in this unit because of the very slow permeability and lack of a suitable outlet.

This unit is poorly suited to recreational development. It is limited mainly by frequent periods of flooding and wetness.

This unit is poorly suited to urban development. The main limitations are frequent periods of flooding, wetness, and a high shrink-swell potential during alternate periods of wetting and drying. Many homes and other structures have been constructed on this unit. These structures are subject to frequent periods of flooding in summer, and foundations are subject to damage because of shrinking and swelling. Backfilling excavations with material that has low shrink-swell potential and installing tile drains around footings, foundations, and building sites help to overcome the limitations of shrink-swell potential and flooding. Drainage systems are of limited benefit on this unit because of the very slow permeability and lack of a suitable outlet.

CC—Charette-Capulin association, gently undulating. This map unit is on the lower part of side slopes in areas of basalt flows. Slope is 0 to 3 percent. Areas are irregular in shape and are 40 to 1,000 acres in size. The native vegetation is mainly grass. Elevation is

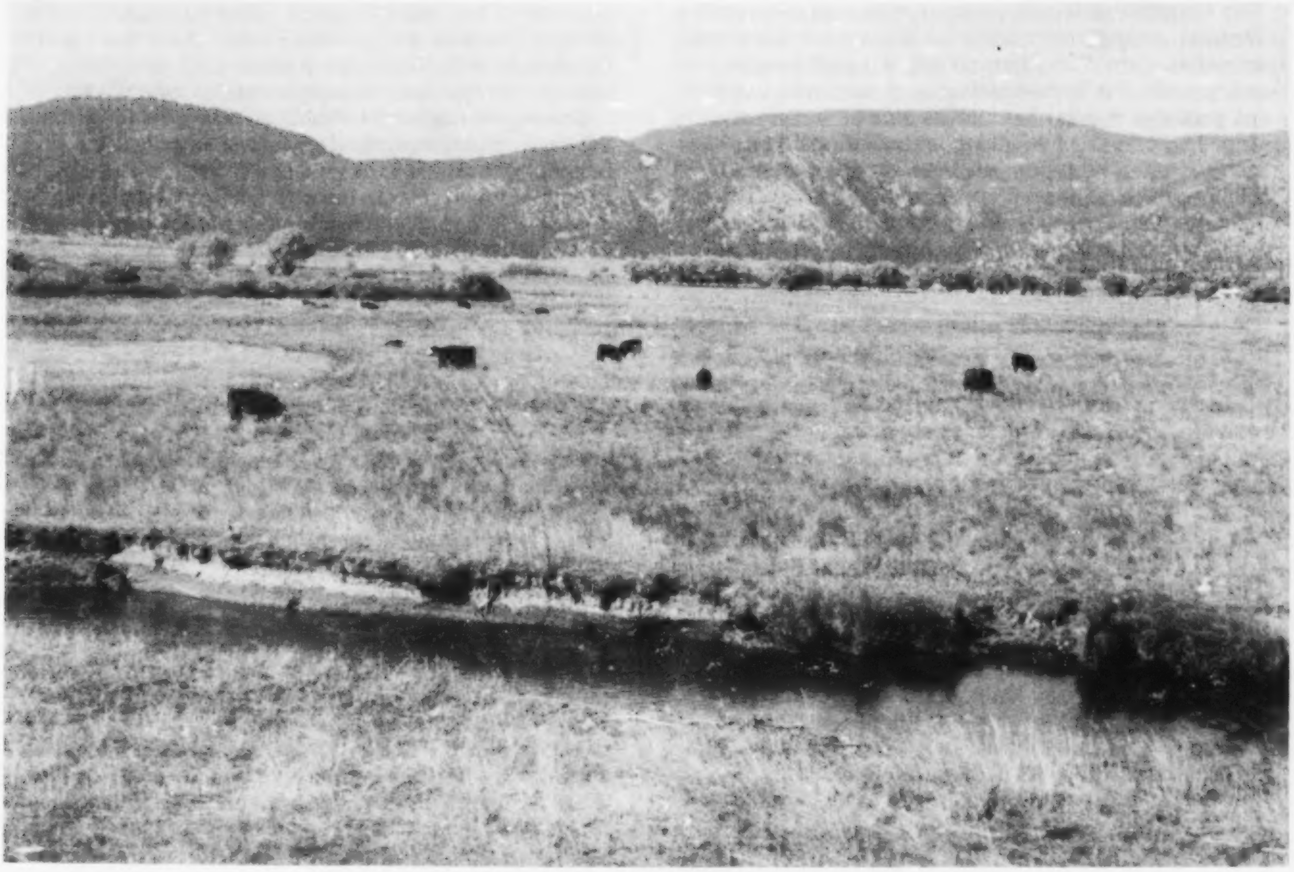

Figure 7.—Cattle grazing on Ceboya silty clay loam, 0 to 1 percent slopes.

6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit is 65 percent Charette loam, 0 to 3 percent slopes, and 20 percent Capulin loam, 1 to 3 percent slopes (fig. 8). The Charette soil is in the slightly concave and more nearly level areas, and the Capulin soil is in the slightly convex areas.

Included in this unit are small areas of Apache and Ayon soils and Rock outcrop along ridges and drainageways and near the edge of mapped areas, La Brier soils in swales and in the few scattered potholes in the unit, and Yankee and Barela soils near the edge of mapped areas at the higher elevations. Included areas make up about 15 percent of the total acreage.

The Charette soil is deep and well drained. It formed in alluvial sediment derived dominantly from basalt and modified with eolian material. Typically, the surface layer is brown loam 2 inches thick. The upper 10 inches of the subsoil is brown loam, the next 39 inches is brown and yellowish brown clay loam and the lower part to a depth of 70 inches is brown clay loam and sandy clay loam.

Permeability of the Charette soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

The Capulin soil is deep and well drained. It formed in alluvial material derived dominantly from basalt and modified with eolian material. Typically, the surface layer is brown loam 12 inches thick. The upper 16 inches of the subsoil is brown and light yellowish brown clay loam, and the lower 7 inches is light yellowish brown silty clay loam. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Permeability of the Capulin soil is moderate. Available water capacity is high. Effective rooting depth is 60

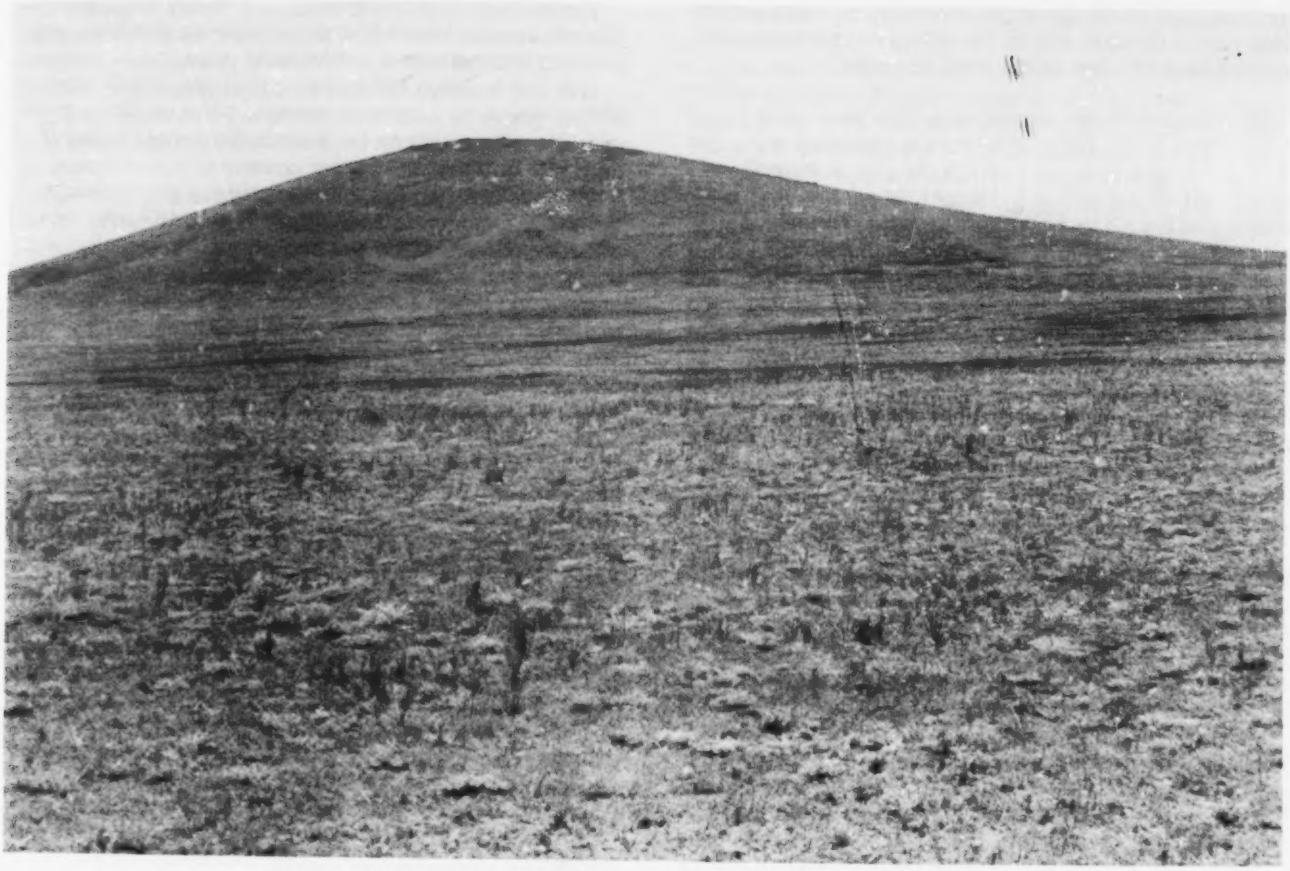

Figure 8.—Area of Charette-Capulin association, gently undulating, in foreground.

inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, sideoats grama, bottlebrush squirreltail, and galleta. As the potential natural plant community deteriorates, western wheatgrass and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, sideoats grama, and blue grama.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, and sideoats grama. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other suitable practices are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is well suited to recreational development. The Charette soil has few limitations, and the Capulin soil is limited mainly by dustiness during extended dry periods. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

If this unit is used for urban development, it is limited mainly by a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

CD—Colmor loam, undulating. This deep, well drained soil is on upland side slopes. It formed in moderately fine textured material derived dominantly from shale. Slope is 1 to 5 percent. Areas are irregular in shape and are 40 to 1,000 acres in size. The native vegetation is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the upper 2 inches of the surface layer is brown loam and the lower 8 inches is dark grayish brown loam. The upper 7 inches of the subsoil is dark grayish brown loam, the next 15 inches is brown silty clay loam, and the lower 8 inches is pale brown loam. The substratum to a depth of 60 inches or more is light gray and very pale brown loam.

Included in this unit are small areas of Karde soils on the leeward side of potholes, La Brier and Vermejo soils on the bottom of a few scattered potholes and in swales and drainageways, Litle soils in the steeper, convex areas near the edge of mapped areas, and Swastika soils in level and concave areas. Included areas make up about 20 percent of the total acreage.

Permeability of the Colmor soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, galleta, and bottlebrush squirreltail. As the potential natural plant community deteriorates, western wheatgrass and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase and cholla invades. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass.

Rangeland seeding is a suitable practice. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, sideoats grama, and galleta. Cholla can be controlled by chemical, mechanical, or hand operations.

Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other suitable practices are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is suited to recreational development. It is limited mainly by dustiness during dry periods. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is suited to urban development. It is limited mainly by a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

Ce—Colmor silt loam, 1 to 3 percent slopes. This deep, well drained soil is on upland side slopes. It formed in moderately fine textured material derived dominantly from shale. Areas are irregular in shape and are 10 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is grayish brown silt loam 3 inches thick. The upper 12 inches of the subsoil is brown silty clay loam, and the lower 10 inches is light yellowish brown silt loam. The substratum to a depth of 60 inches or more is very pale brown silt loam.

Included in this unit are small areas of La Brier soils in swales, Litle soils in the steeper, convex areas near the edge of mapped areas, Swastika soils in level and concave areas, Ustifluvents in drainageways, and Vermejo soils on the bottom of potholes and in swales and drainageways. Included areas make up about 20 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Colmor soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. Some areas are used for recreational and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, galleta, and bottlebrush squirreltail. As the potential natural plant community deteriorates, western wheatgrass and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase and cholla invades. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass.

Rangeland seeding is a suitable practice. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, sideoats grama, and galleta. Cholla can be controlled by chemical, mechanical, or hand operations.

Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other suitable practices are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and water erosion.

If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum.

This unit is well suited to hay and pasture. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage.

This unit is suited to recreational development. It is limited mainly by dustiness during dry periods. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is suited to urban development. It is limited mainly by a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

CF—Crews-Tricon association, undulating. This map unit is on uplands. Slope is 0 to 5 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 45 percent Crews silt loam and 40 percent Tricon silt loam. The Crews soil is in the higher lying, convex areas and along ridges, and the Tricon soil is in the lower lying, slightly concave areas and below ridges.

Included in this unit are small areas of Bernal soils near the edge of mapped areas, La Brier and Manzano soils in swales and drainageways, Partri soils in the lower lying, concave areas near the edge of mapped areas, and indurated caliche and sandstone outcroppings in the form of ridges throughout the unit. Included areas make up about 15 percent of the total acreage.

The Crews soil is shallow and well drained. It formed in mixed eolian sediment derived dominantly from local sources. Typically, the surface layer is brown silt loam 3 inches thick. The subsoil is brown clay loam 11 inches thick. Indurated caliche is at a depth of 14 inches.

Permeability of the Crews soil is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 19 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Tricon soil is moderately deep and well drained. It formed in old alluvium and eolian sediment derived dominantly from local sources. Typically, the surface layer is brown silt loam 4 inches thick. The subsoil is brown clay loam 24 inches thick. The substratum is pink gravelly clay loam 12 inches thick over indurated caliche.

Permeability of the Tricon soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The potential natural plant community on the Crews soil is mainly sideoats grama, blue grama, little bluestem, and New Mexico feathergrass. As the potential natural plant community deteriorates, sideoats grama, little bluestem, and New Mexico feathergrass decrease and there is an increase in ring muhly, threeawn, broom snakeweed, and oneseed juniper, which normally occur in small amounts in the potential natural plant community. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama and New Mexico feathergrass.

Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and livestock watering facilities is difficult on the Crews soil because of the shallow soil depth. This soil is poorly suited to such rangeland management practices as rangeland seeding and mechanical brush management because of the shallow depth.

The potential natural plant community on the Tricon soil is mainly blue grama, western wheatgrass, galleta, and sideoats grama. As the potential natural plant community deteriorates, western wheatgrass, galleta, and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase and oneseed juniper and sleepygrass invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass and blue grama.

Rangeland seeding is suitable on the Tricon soil. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, sideoats grama, and galleta. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, and tanks. The Tricon soil is suited to such rangeland management practices as mechanical brush management.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Crews soil ranges from 1,100 pounds per acre in favorable years to 400 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Tricon soil ranges from 1,600 pounds per acre in favorable years to 550 pounds in unfavorable years.

The Crews soil is poorly suited to recreational development. It is limited mainly by shallow depth over indurated caliche. The Tricon soil is well suited to recreational development. It has few limitations.

The Crews soil is poorly suited to most types of urban development. The main limitations are shallow depth over indurated caliche and clayey soil material that has a high shrink-swell potential during alternate periods of wetting and drying. The Tricon soil is suited to urban and rural development. The main limitations are indurated caliche at a depth of 20 to 40 inches and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

CN—Cundiyo-Nambe Variant association, extremely steep. This map unit is on mountainsides. Slope is 30 to 60 percent. Areas are irregular in shape and are 80 to 640 acres in size. The native vegetation is mainly coniferous trees. Elevation is 8,500 to 11,600 feet. The average annual precipitation is 22 to 28 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 50 to 80 days.

This unit is 50 percent Cundiyo very stony sandy loam, 30 to 60 percent slopes, and 25 percent Nambe Variant very cobbly loam, 40 to 60 percent slopes. The Cundiyo soil is on the lower mountainsides and in the less sloping areas, and the Nambe Variant soil is on the upper mountainsides and in the steeper areas.

Included in this unit are small areas of Holman soils on valley bottoms adjacent to drainageways, Maes and Etoe soils near the edge of mapped areas at the lower elevations, Moreno and Brycan soils in open valleys, and areas of Rock outcrop and Rubble land scattered throughout the unit. Included areas make up about 25 percent of the total acreage.

The Cundiyo soil is deep and well drained. It formed in mixed material derived from gneiss, schist, and other metamorphic rock. Typically, the surface is covered with a mat of decomposing litter 2 inches thick. The surface layer is brown very stony sandy loam 5 inches thick. The next layer is pale brown very stony sandy loam 15 inches thick. The next layer is very pale brown very stony sandy loam 18 inches thick. The subsoil is very pale brown very stony sandy loam 7 inches thick. The substratum to a depth of 60 inches or more is very pale brown extremely stony sandy loam.

Permeability of the Cundiyo soil is moderately rapid. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Nambe Variant soil is deep and well drained. It formed in mixed material derived from gneiss, schist, and other metamorphic rock. Typically, the surface layer is very dark grayish brown very cobbly loam 4 inches thick. The subsurface layer is brown very cobbly fine sandy loam 11 inches thick. The subsoil is reddish yellow extremely cobbly sandy loam 10 inches thick. The substratum to a depth of 60 inches or more is reddish yellow extremely cobbly sandy loam.

Permeability of the Nambe Variant soil is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly as woodland in the less sloping areas, for wildlife habitat, and as watershed. Some areas are used for recreation and urban development.

The Cundiyo soil has limited suitability for the production of white fir, Englemann spruce, and Douglas-fir for timber because of slope, the areas of Rubble land and Rock outcrop, and stones on the surface. The site index for white fir ranges from 80 to 85. On the basis of a site index of 85, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 6,055 cubic feet or 35,750 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 71 cubic feet or 310 board feet (International rule) per acre. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The Nambe Variant soil has very limited suitability for production of Douglas-fir, white fir, and Englemann spruce for timber because of slope, cobbles on the surface, and the areas of Rubble land and Rock outcrop. The site index for Douglas-fir ranges from 44 to 54. On the basis of a site index of 50, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 2,500 cubic feet or 9,200 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 30 cubic feet or 90 board feet (International rule) per acre. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The main concerns for producing and harvesting timber on this unit are the hazard of erosion, equipment limitations, seedling mortality, plant competition, and the hazard of windthrow. Minimizing the risk of erosion is essential in harvesting timber. Proper design of road drainage systems and care in the placement of culverts help to control erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. The steepness of slope limits the kinds of equipment that can be used in forest management. The areas of Rock outcrop and Rubble land also interfere with logging. Seedlings are subject to high mortality rates because of exposure, droughtiness of the soils, and the high content of rock fragments in the soils. Trees commonly are subject to windthrow during periods when the soils are excessively wet and winds are strong. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

This unit is poorly suited to recreational development. It is limited mainly by slope, areas of Rock outcrop, and stones and cobbles on the surface.

This unit is poorly suited to urban development. The main limitations are slope, areas of Rock outcrop and Rubble land, and stones and cobbles on the surface and in the soil.

DA—Dalcan-Raton complex, undulating. This map unit is on basalt-capped mesas. Slope is 0 to 5 percent. Areas are broad and rounded in shape and are 80 to 640 acres in size. The native vegetation is mainly ponderosa pine with an understory of grass. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 40 percent Dalcan cobbly loam, 0 to 5 percent slopes, and 40 percent Raton very cobbly loam, 3 to 5 percent slopes. The Dalcan soil is in the more nearly level, concave areas, and the Raton soil is in the slightly convex areas and along ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Barela and Yankee soils in narrow valleys, Burnac soils in the steeper areas near the edge of mapped areas, Saladon soils in the potholes in the unit, and Raton very stony silt loam, Dalcan stony silt loam, and Rock outcrop scattered throughout the unit. Included areas make up about 20 percent of the total acreage.

The Dalcan soil is moderately deep and well drained. It formed in residuum derived from basalt. Typically, the surface layer is dark brown cobbly loam 4 inches thick. The upper 9 inches of the subsoil is dark brown very cobbly clay loam, and the lower 15 inches is brown very cobbly clay. Hard basalt is at a depth of 28 inches.

Permeability of the Dalcan soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Raton soil is shallow and well drained. It formed in residuum derived from basalt. Typically, the surface layer is brown very cobbly loam 6 inches thick. The subsoil is brown very stony silty clay 6 inches thick. Hard basalt is at a depth of 12 inches.

Permeability of the Raton soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly for woodland, livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The included Barela and Yankee soils receive extra runoff from adjacent areas in this unit; therefore, they have the potential to be major forage producers in the unit.

The Dalcan soil is suited to the production of ponderosa pine for timber. The site index for ponderosa pine ranges from 65 to 67. On the basis of a site index of 65, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,025 cubic feet or 18,300 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 50 cubic feet or 94 board feet (International rule) per acre.

The Raton soil is suited to the production of ponderosa pine for timber. The site index for ponderosa pine ranges from 62 to 69. On the basis of a site index of 65, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,025 cubic feet or 18,300 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 49 cubic feet or 103 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on this unit are equipment limitations, seedling mortality, and the hazard of windthrow. Conventional methods of harvesting timber generally can be used, but their use may be limited when the soil is wet. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging. The very low available water capacity generally influences seedling survival in areas where understory plants are numerous.

Seedlings are subject to moderate mortality rates because of exposure, droughtiness of the soils, and the high content of rock fragments in the soils. Trees are subject to windthrow because of limited rooting depth. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

The potential understory vegetation on this unit is mainly prairie junegrass, mountain muhly, Arizona fescue, western wheatgrass, and little bluestem. As the density of the canopy cover increases or the understory plant community deteriorates, these plants decrease and there is an increase of Gambel oak, sagewort, and cinquefoil.

Grazing management should be designed to increase the productivity and reproduction of mountain muhly and Arizona fescue. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and watering facilities is difficult on this unit because of the shallow soil depth, the areas of Rock outcrop, and cobbles on the surface. Effective livestock distribution can be accomplished by proper placement of salt. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry understory vegetation on the Dalcan soil ranges from 800 pounds per acre in favorable years to 400 pounds in unfavorable years.

The average annual production of air-dry understory vegetation on the Raton soil ranges from 600 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is poorly suited to recreational development. The Dalcan soil is limited mainly by cobbles on the surface, and the Raton soil is limited mainly by cobbles on the surface and basalt at a depth of 10 to 20 inches.

This unit is poorly suited to urban development. The main limitations are cobbles on the surface, cobbles and stones in the soil, restricted depth to bedrock, and a shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

DF—Dargol-Fuera association, hilly. This map unit is on mountainsides and mesas. Slope is 5 to 25 percent. Areas are irregular in shape and are 50 to 640 acres in size. The native vegetation is mainly conifers with an understory of grass. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 19 inches, the average annual air temperature is 38 to 46 degrees F, and the average frost-free period is 85 to 110 days.

This unit is 50 percent Dargol stony loam and 30 percent Fuera cobbly loam. The Dargol soil is at the lower elevations on mesas and mountainsides, and the Fuera soil is mainly at the higher elevations on north- and west-facing side slopes.

Included in this unit are small areas of Brycan and Moreno soils in narrow valleys; Etoe soils near the edge of mapped areas at the higher elevations; Firo, Rocio, and Vamer soils and Eutroboralfs near the edge of mapped areas at the lower elevations; Holman soils adjacent to drainageways; and Rock outcrop scattered throughout the unit. Included areas make up about 20 percent of the total acreage.

The Dargol soil is moderately deep and well drained. It formed in fine textured residuum derived from shale and sandstone. Typically, the surface layer is grayish brown stony loam 6 inches thick. The subsoil is light brown clay 32 inches thick. Hard brown sandstone is at a depth of 38 inches.

Permeability of the Dargol soil is very slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Fuera soil is deep and well drained. It formed in colluvial and alluvial material derived dominantly from sandstone and shale. Typically, the surface layer is brown cobbly loam 4 inches thick. The subsurface layer is brown cobbly loam 11 inches thick. The upper 17 inches of the subsoil is light brown clay, and the lower part to a depth of 60 inches or more is light yellowish brown very cobbly clay.

Permeability of the Fuera soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. It is also used for livestock grazing in the less sloping areas. Some areas are used for recreational and urban development.

The Dargol soil is suited to the production of ponderosa pine and Douglas-fir for timber and to the production of white fir for timber and Christmas trees. The site index for ponderosa pine ranges from 65 to 75. On the basis of a site index of 70, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,480 cubic feet or 22,000 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 48 cubic feet or 220 board feet (International rule) per acre.

Timber production on the Dargol soil is limited mainly by slope and stones. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The Fuera soil is suited to the production of Douglas-fir and ponderosa pine for timber and to the production of white fir for timber and Christmas tree production. It is limited mainly by slope and cobbles on the surface. The site index for Douglas-fir ranges from 45 to 65. On the basis of a site index of 55, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 3,900 cubic feet or 14,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 42 cubic feet or 110 board feet (International rule) per acre.

Tree growth on the Fuera soil is slow. Precommercial and commercial thinnings should be used to accelerate growth of the more desirable trees. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The main concerns for producing and harvesting timber on this unit are water erosion, equipment limitations, and seedling mortality. Minimizing the risk of water erosion is essential in harvesting timber. Conventional methods of harvesting timber generally can be used, but their use may be limited when the soil is wet. Roads and landings can be protected from erosion by constructing water bars and by seeding cuts and fills. Rock outcrop interferes with logging. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality. Among the trees that are suitable for planting are white fir and Douglas-fir.

The included Etoe and Rocio soils in this unit have a higher site index for ponderosa pine than the Dargol soil. Because of this, these included soils have a significant potential for production of timber in small areas of this unit.

The potential understory vegetation on this unit is mainly mountain muhly, Arizona fescue, and kinnikinnick. As the density of the canopy cover increases or the understory plant community deteriorates, mountain muhly and Arizona fescue decrease and kinnikinnick, Gambel oak, and cinquefoils increase.

Grazing management should be designed to increase the vigor, productivity, and reproduction of mountain muhly and Arizona fescue. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level. Slope limits access by livestock, which results in overgrazing of the less sloping areas.

This unit has limited suitability for rangeland management practices such as mechanical brush management and installation of pipelines for providing stock water and watering facilities because of stones and cobbles on the surface and in the soil and slope. Effective livestock distribution can be accomplished by proper location of salt. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry understory vegetation on the Dargol soil ranges from 700 pounds per acre in favorable years to 400 pounds in unfavorable years.

The average annual production of air-dry understory vegetation on the Fuera soil ranges from 800 pounds per acre in favorable years to 500 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by stones and cobbles on the surface and slope.

The Dargol soil is poorly suited to urban development. The main limitations are stones on the surface and in the soil, bedrock at a depth of 20 to 40 inches, and a high shrink-swell potential during alternate periods of wetting and drying. The Fuera soil is poorly suited to urban development. The main limitations are cobbles on the surface and in the lower part of the soil and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

DR—Dargol-Rocio-Vamer association, hilly. This map unit is on mountainsides and mesas. Slope is 5 to 25 percent. Areas are irregular in shape and are 50 to 640 acres in size. The native vegetation is mainly conifers with an understory of grass and oak. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 22 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 35 percent Dargol stony loam, 5 to 25 percent slopes (fig. 9), 30 percent Rocio gravelly loam, 9 to 25 percent slopes, and 20 percent Vamer stony loam, 5 to 25 percent slopes. The Dargol soil is in the less sloping areas on all aspects; the Rocio soil is in the steeper areas, mainly on the north- and west-facing side slopes; and the Vamer soil is on all aspects along ridges and on benches and mesas.

Included in this unit are small areas of Brycan and Moreno soils in narrow valleys; Etoe soils near the edge of mapped areas at the higher elevations; Firo and Hesperus soils and Eutroboralfs near the edge of mapped areas; Holman soils adjacent to drainageways; and Rocio stony loams and Rock outcrop scattered throughout the unit. Included areas make up about 15 percent of the total acreage.

The Dargol soil is moderately deep and well drained. It formed in fine textured residuum derived from shale and sandstone. Typically, the surface is covered with a mat of forest litter 1 inch thick. The surface layer is grayish brown stony loam 4 inches thick. The subsurface layer is brown stony loam 8 inches thick. The subsoil is light brown clay 15 inches thick. Hard, reddish brown

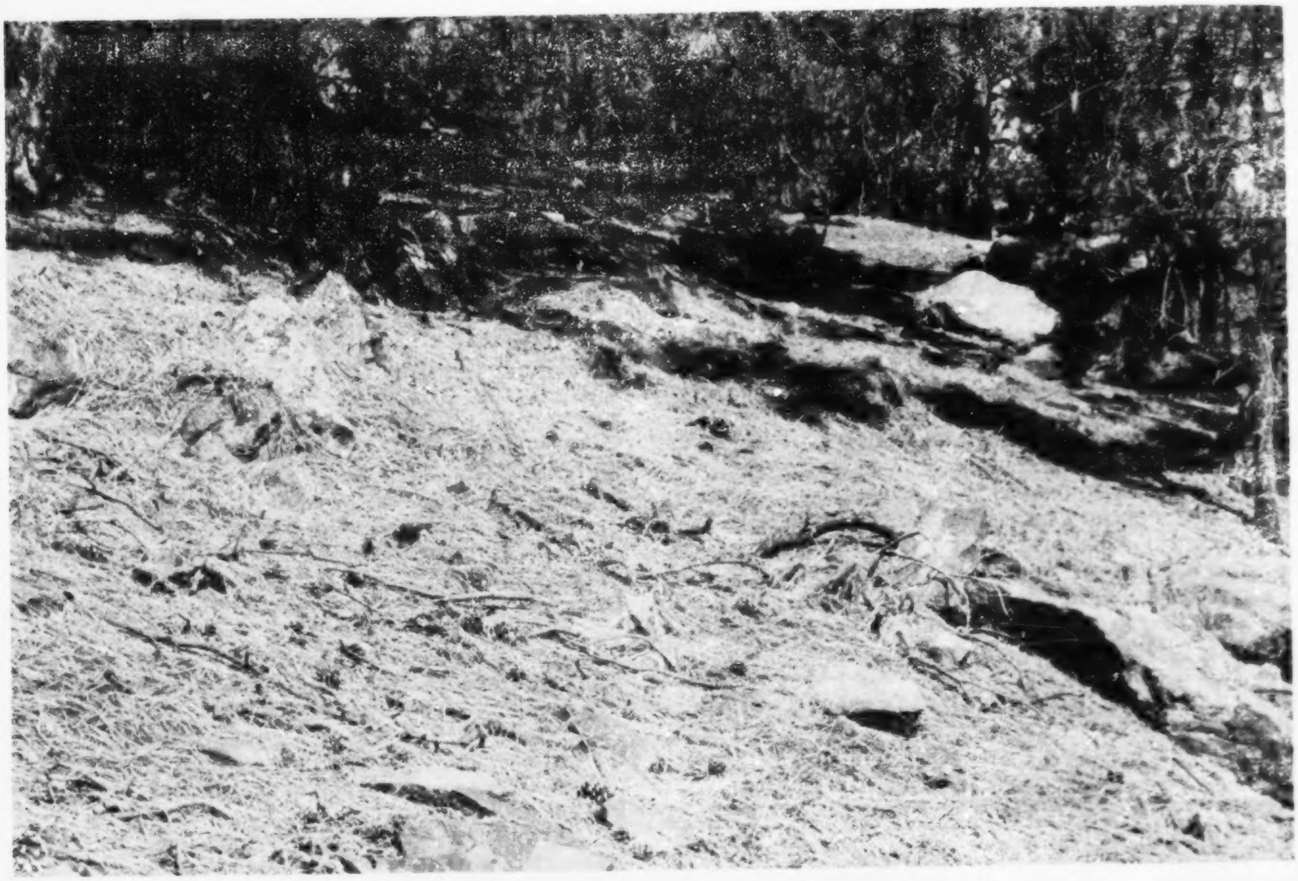

Figure 9.—Area of Dargol stony loam under ponderosa pine.

sandstone underlain by interbedded shale is at a depth of 27 inches.

Permeability of the Dargol soil is very slow. Available water capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Rocio soil is deep and well drained. It formed in alluvial and colluvial material derived dominantly from sandstone and shale. Typically, the surface layer is dark grayish brown gravelly loam 7 inches thick. The subsurface layer is brown gravelly loam 7 inches thick. The upper 6 inches of the subsoil is brown silty clay, and the lower part to a depth of 60 inches or more is brown and light brown clay.

Permeability of the Rocio soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Vamer soil is shallow and well drained. It formed in old sediment derived dominantly from sandstone and shale. Typically, the surface layer is dark grayish brown stony loam 3 inches thick. The subsurface layer is brown stony loam 5 inches thick. The subsoil is yellowish brown clay 9 inches thick. Hard, yellowish brown sandstone is at a depth of 17 inches.

Permeability of the Vamer soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. It is also used for livestock grazing in the less sloping areas. Some areas are used for recreational and urban development.

The Dargol soil is suited to the production of ponderosa pine and Douglas-fir for timber and to the production of white fir for timber and Christmas trees. The site index for ponderosa pine ranges from 65 to 75.

On the basis of a site index of 70, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,480 cubic feet or 22,000 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 48 cubic feet or 220 board feet (International rule) per acre. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The Rocio soil is suited to the production of ponderosa pine and Douglas-fir for timber and to the production of white fir for timber and Christmas trees. The site index for ponderosa pine ranges from 70 to 80. On the basis of a site index of 75, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,945 cubic feet or 26,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 52 cubic feet or 266 board feet (International rule) per acre. Pebbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The main concerns for producing and harvesting timber on the Dargol and Rocio soils are a hazard of water erosion and equipment limitations. Minimizing the risk of water erosion is essential in harvesting timber. Roads and landings can be protected from water erosion by constructing water bars and by seeding cuts and fills. Conventional methods of harvesting timber can be used. The steepness of slope in some areas limits the kinds of equipment that can be used in forest management. Rock outcrop also interferes with logging. Among the trees that are suitable for planting are ponderosa pine and Douglas-fir. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

The included Etoe soils in this unit have a higher site index for ponderosa pine than the Dargol soil. Because of this, these included soils have a significant potential for production of timber in small areas of this unit.

The potential understory vegetation on the Dargol and Rocio soils is mainly Arizona fescue, pine dropseed, mountain muhly, and Gambel oak.

The potential natural plant community on the Vamer soil is mainly Arizona fescue, mountain muhly, prairie junegrass, little bluestem, needlegrass, and Gambel oak. As the potential natural plant community deteriorates, the palatable grasses decrease and there is an increase in Gambel oak, Rocky Mountain juniper, and sagewort, which normally occur in small amounts in the potential natural plant community. Ponderosa pine from the adjacent woodland soil invades the Vamer soil.

Grazing management should be designed to increase the productivity and reproduction of Arizona fescue, mountain muhly, and prairie junegrass. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

This unit has limited suitability for rangeland management practices such as installation of watering facilities, mechanical brush management, and rangeland seeding because of the shallow depth to bedrock, slope, and stones on the surface. Effective livestock distribution can be accomplished by proper location of fences and salt. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry understory vegetation on the Dargol soil ranges from 700 pounds per acre in favorable years to 200 pounds in unfavorable years.

The average annual production of air-dry understory vegetation on the Rocio soil ranges from 800 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Vamer soil ranges from 1,300 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is poorly suited to recreational development. The Dargol soil is limited mainly by stones on the surface and slope, the Rocio soil is limited mainly by pebbles on the surface and slope, and the Vamer soil is limited mainly by stones on the surface, slope, and bedrock at a depth of 7 to 20 inches.

This unit is poorly suited to urban development. The main limitations of the Dargol soil are stones on the surface, bedrock at a depth of 20 to 40 inches, and a high shrink-swell potential during alternate periods of wetting and drying. The main limitations of the Rocio soil are pebbles on the surface and a high shrink-swell potential. The main limitations of the Vamer soil are stones on the surface, bedrock at a depth of 7 to 20 inches, and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

DV—Dargol-Rocio-Vamer association, very steep. This map unit is on mountainsides. Slope is 25 to 50 percent. Areas are irregular in shape and are 50 to 640 acres in size. The native vegetation is mainly conifers with an understory of grass and brush. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 24 inches, the average annual air temperature is 40 to 46 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 35 percent Dargol stony loam, 25 to 45 percent slopes; 35 percent Rocio stony loam, 25 to 50 percent slopes; and 15 percent Vamer stony loam, 25 to 40 percent slopes. The Dargol soil is in the less sloping areas on all aspects, the Rocio soil is mainly on the steeper, north- and west-facing side slopes, and the

Vamer soil is on all aspects along ridges and on benches.

Included in this unit are small areas of Brycan and Moreno soils in narrow valleys; Firo soils and Eutroboralfs near the edge of mapped areas; Fuera, Maes, and Etoe soils near the edge of mapped areas at the higher elevations; and Rocio gravelly loams and Rock outcrop scattered throughout the unit. Included areas make up about 15 percent of the total acreage.

The Dargol soil is moderately deep and well drained. It formed in fine textured residuum derived from shale and sandstone. Typically, the surface layer is dark grayish brown stony loam 2 inches thick. The subsurface layer is brown stony loam 6 inches thick. The subsoil is yellowish brown clay 27 inches thick. Hard, red sandstone is at a depth of 35 inches.

Permeability of the Dargol soil is very slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Rocio soil is deep and well drained. It formed in alluvial and colluvial material derived dominantly from sandstone and shale. Typically, the surface is covered with a mat of forest litter 1 inch thick. The surface layer is dark grayish brown stony loam 5 inches thick. The subsurface layer is brown stony loam 10 inches thick. The subsoil to a depth of 65 inches or more is brownish yellow and light yellowish brown clay.

Permeability of the Rocio soil is slow. Available water capacity is high. Effective rooting depth is 65 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Vamer soil is shallow and well drained. It formed in old sediment derived dominantly from sandstone and shale. Typically, the surface is covered with a mat of forest litter 1 inch thick. The surface layer is dark grayish brown stony loam 3 inches thick. The upper 4 inches of the subsoil is brown clay loam, and the lower 9 inches is light yellowish brown clay. Hard, brown sandstone is at a depth of 16 inches.

Permeability of the Vamer soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. It is also used for livestock grazing in the less sloping areas. Some areas are used for recreational and urban development.

The Dargol soil is suited to the production of ponderosa pine and Douglas-fir for timber and to the production of white fir for timber and Christmas trees. The site index for ponderosa pine ranges from 55 to 70. On the basis of a site index of 58, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 3,570 cubic feet or 14,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 39 cubic feet or 146 board feet (International rule) per acre. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The Rocio soil is suited to the production of ponderosa pine and Douglas-fir for timber and to the production of white fir for timber and Christmas trees. The site index for ponderosa pine ranges from 70 to 80. On the basis of a site index of 72, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,666 cubic feet or 23,840 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 50 cubic feet or 238 board feet (International rule) per acre. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The main concerns for producing and harvesting timber on the Dargol and Rocio soils are a hazard of water erosion and equipment limitations. Minimizing the risk of water erosion is essential in harvesting timber. Roads and landings can be protected from water erosion by constructing water bars and by seeding cuts and fills. Conventional methods of harvesting timber can be used. The steepness of slope limits the kinds of equipment that can be used in forest management. Rock outcrop also interferes with logging. Among the trees that are suitable for planting are ponderosa pine and Douglas-fir. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

The included Etoe soils in this unit have a higher site index for ponderosa pine than the Dargol soil. The included Maes soils support a quality stand of merchantable Douglas-fir and white fir. Because of this, these included soils have a significant potential for production of timber in small areas of this unit.

The potential understory vegetation on the Dargol and Rocio soils is mainly Arizona fescue, pine dropseed, mountain muhly, and Gambel oak.

The potential natural plant community on the Vamer soil is mainly Arizona fescue, mountain muhly, prairie junegrass, little bluestem, needlegrass, and Gambel oak. As the potential natural plant community deteriorates, the palatable grasses decrease and there is an increase in Gambel oak, Rocky Mountain juniper, and sagewort, which normally occur in small amounts in the potential natural plant community. Ponderosa pine from the adjacent woodland soils readily increases on the Vamer soil.

This unit has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Mechanical treatment is not practical because of the stones on the surface and slope. Grazing management should be designed to increase the productivity and reproduction of Arizona fescue, mountain muhly, and prairie junegrass. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry understory vegetation on the Dargol soil ranges from 700 pounds per acre in favorable years to 200 pounds in unfavorable years.

The average annual production of air-dry understory vegetation on the Rocio soil ranges from 800 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Vamer soil ranges from 1,200 pounds per acre in favorable years to 500 pounds in unfavorable years.

This unit is poorly suited to recreational development. The main limitations are stones on the soil surface and slope.

This unit is poorly suited to urban development. The main limitations on the Dargol soil are stones on the surface, bedrock at a depth of 20 to 40 inches, slope, and a high shrink-swell potential during alternate periods of wetting and drying. The main limitations of the Rocio soil are stones on the surface, slope, and a high shrink-swell potential. The main limitations of the Vamer soil are stones on the surface, bedrock at a depth of 7 to 20 inches, slope, and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

EE—Etoe-Etown association, very steep. This map unit is on mountainsides in the Rincon Mountains. Slope is 25 to 55 percent. Areas are irregular in shape and are 100 to 1,000 acres in size. The native vegetation is mainly conifers. Elevation is 9,000 to 11,000 feet. The average annual precipitation is 18 to 24 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is less than 90 days.

This unit is 40 percent Etoe cobbly loam, 25 to 55 percent slopes, and 35 percent Etown gravelly loam, 35 to 55 percent slopes. The Etoe soil is in the less sloping areas, mainly on the lower part of mountainsides, and the Etown soil is in the steeper areas, mainly on the lower part of mountainsides.

Included in this unit are small areas of Krakon soils near the edge of mapped areas in the Chacon area; Burnac and Spud soils near the edge of mapped areas in the Little Blue Creek and Big Blue Creek areas; Eutroboralfs near the edge of mapped areas throughout the Rincon Mountains; Fuera and Dargol soils in the less sloping areas and near the edge of mapped areas at the lower elevations; Moreno, Brycan, and Holman soils in narrow valleys; and Etoe very cobbly sandy loams, Rock outcrop, and Rubble land scattered throughout the unit. Included areas make up about 25 percent of the total acreage.

The Etoe soil is deep and well drained. It formed in alluvial and colluvial material derived dominantly from sandstone and shale. Typically, the surface layer is pale brown cobbly loam 10 inches thick. The subsurface layer is pale brown very cobbly sandy loam 18 inches thick. The subsoil to a depth of 60 inches or more is yellowish brown and brown very cobbly sandy clay loam.

Permeability of the Etoe soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Etown soil is deep and well drained. It formed in alluvial and colluvial material derived dominantly from sandstone and shale. Typically, the surface is covered with a mat of decomposing and decomposed forest litter 3 inches thick. The surface layer is dark grayish brown gravelly loam 3 inches thick. The subsurface layer is pinkish gray very gravelly loam 8 inches thick. The upper 4 inches of the subsoil is light brown very gravelly clay loam, and the lower part to a depth of 60 inches or more is reddish yellow extremely gravelly clay.

Permeability of the Etown soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The Etoe soil is suited to the production of Douglas-fir, ponderosa pine, and white fir for timber. The site index for ponderosa pine ranges from 70 to 80. On the basis of a site index of 75, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,945 cubic feet or 26,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 52 cubic feet or 266 board feet (International rule) per acre. The site index for Douglas-fir ranges from 60 to 78. On the basis of a site index of 70, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,945 cubic feet or 26,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 52 cubic feet or 266 board feet (International rule) per acre. The site index for white fir ranges from 60 to 78. On the basis of a site index of 70, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,480 cubic feet or 22,000 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 47 cubic feet or 223 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on the Etoe soil are the hazard of water erosion, equipment limitations, and seedling mortality. Minimizing the risk of water erosion is essential in harvesting timber. Roads and landings can be protected from water erosion by constructing water bars and by seeding cuts and fills. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging. Conventional methods of harvesting timber can be used. The steepness of slope limits the kinds of equipment that can be used in forest management. Seedlings are subject to moderate mortality rates because of exposure, a dense canopy in some areas, and the high content of rock fragments in the soil.

The Etown soil is suited to the production of Douglas-fir, white fir, ponderosa pine, and limber pine for timber. The site index for Douglas-fir ranges from 60 to 78. On the basis of a site index of 70, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,480 cubic feet or 22,000 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 47 cubic feet or 223 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on the Etown soil are equipment limitations, seedling mortality, and plant competition. Pebbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging. Conventional methods of harvesting timber can generally be used. The steepness of slope limits the kinds of equipment that can be used in forest management. Seedlings are subject to moderate to high mortality rates because of exposure, a dense canopy in some areas, and the high content of rock fragments in the soil.

An undisturbed buffer or filter strip should be left along all watercourses in this unit to reduce sedimentation and maintain water quality.

This unit is poorly suited to recreational development. It is limited mainly by cobbles and pebbles on the surface and slope.

This unit is poorly suited to urban development. The main limitations of the Etoe soil are cobbles on the surface and slope. The main limitations of the Etown soil are pebbles on the surface, slope, and a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

ER—Etoe-Rock outcrop-Rubble land complex, extremely steep. This map unit is on mountainsides in the Rincon Mountains. Slope is 40 to 70 percent. Areas are irregular in shape and are 200 to 1,000 acres in size. The native vegetation is mainly conifers. Elevation is 9,000 to 11,000 feet. The average annual precipitation is 18 to 24 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is less than 90 days.

This unit is 35 percent Etoe cobbly fine sandy loam, 40 to 60 percent slopes; 25 percent Rock outcrop; and 20 percent Rubble land, 40 to 70 percent slopes. The Etoe soil is throughout the unit, Rock outcrop occurs as ledges, cliffs, and vertical escarpments, and Rubble land is in rockslide areas dominated by stones and boulders. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Burnac and Spud soils near the edge of mapped areas in the Little Blue Creek and Big Blue Creek areas; Etoe cobbly loam, Etoe very cobbly sandy loam, and Etown soils scattered throughout the unit; Eutroboralfs and Fuera soils near the edge of mapped areas at the lower elevations; Krakon soils near the edge of mapped areas at the lower elevations in the Chacon area; and Moreno, Brycan, and Holman soils in narrow valleys. Included areas make up about 20 percent of the total acreage.

The Etoe soil is deep and well drained. It formed in alluvial and colluvial material derived dominantly from sandstone and shale. Typically, the surface is covered with a mat of undecomposed and decomposed forest litter 2 inches thick. The surface layer is light brownish gray cobbly fine sandy loam 2 inches thick. The upper 10 inches of the subsurface layer is pale brown cobbly loam, and the lower 12 inches is pale brown cobbly fine sandy loam. The upper 4 inches of the subsoil is yellowish brown very cobbly loam, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly loam.

Permeability of the Etoe soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

Rock outcrop is exposed areas of sandstone, shale, arkosic sandstone, and some mixed metamorphic rock. It supports little if any vegetation.

Rubble land consists mainly of stones and boulders derived from sandstone, arkosic sandstone, and mixed metamorphic rock. It supports little if any vegetation.

This unit is used mainly for wildlife habitat, as watershed, and as woodland in the less sloping areas. Some areas are used for recreation and urban development.

The Etoe soil has limited suitability for production of Douglas-fir, ponderosa pine, and white fir for timber because of slope and the areas of Rock outcrop and Rubble land. On the basis of a site index of 60 for Douglas-fir, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 3,570 cubic feet or 14,600 board feet (International rule, 1/8-inch kerf). At the culmination the mean annual increment (CMAI), production is 39 cubic feet or 146 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on this unit are the hazard of water erosion, equipment limitations, seedling mortality, and the hazard of windthrow. Minimizing the risk of water erosion is essential in harvesting timber. Roads and landings can be protected from water erosion by constructing water bars and by seeding cuts and fills. The steepness of slope limits the kinds of equipment that can be used in forest management. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. The areas of Rock outcrop and Rubble land also interfere with logging. Seedlings are subject to moderate mortality rates because of exposure, a dense canopy in some areas, and the high rock fragment content of the soils. Trees commonly are subject to windthrow. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

This unit is poorly suited to recreational or urban development. The main limitations are slope and the areas of Rock outcrop and Rubble land.

EV—Eutroboralfs-Rock outcrop-Vamer complex, extremely steep. This map unit is on mountainsides, ridges, benches, and mesas. Slope is 35 to 65 percent. Areas are irregular in shape and are 50 to 640 acres in size. The native vegetation is mainly oak, shrubs, and grass and scattered overstory of pinyon, juniper, and ponderosa pine. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 22 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free periods is 85 to 110 days.

This unit is 35 percent Eutroboralfs very stony loam, 35 to 65 percent slopes; 30 percent Rock outcrop; and 15 percent Vamer cobbly loam, 35 to 40 percent slopes (fig. 10). The Eutroboralfs are throughout the unit, Rock outcrop occurs as ledges, sheets, and vertical escarpments, and the Vamer soil is in the less sloping areas along ridges and on small mesas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bernal and Sombordoro soils near the edge of mapped areas at the lower elevations; Brycan, Moreno, and Holman soils in narrow valleys; Dargol and Rocio soils scattered throughout the unit and near the edge of mapped areas; Etoe, Fuera, and Maes soils near the edge of mapped areas at the higher elevations; and Krakon soils near the edge of mapped areas in the Chacon area. Included areas make up about 20 percent of the total acreage.

The Eutroboralfs are extremely variable in their characteristics. They are shallow to deep and are well drained. They formed in mixed material derived dominantly from sandstone and shale. No single profile is typical, but one commonly observed in the survey area has a surface layer of reddish brown very stony loam 14 inches thick. The surface is covered with a mat of decomposing branches, twigs, leaves, and grass 1 inch thick. The upper 10 inches of the subsoil is reddish brown very cobbly clay loam, and the lower part to a depth of 60 inches or more is brown and yellowish brown very cobbly clay.

Permeability of the Eutroboralfs is moderate to very slow. Available water capacity is very low to high. Effective rooting depth is 19 to 60 inches or more. Runoff is very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is slight.

Rock outcrop is exposed areas of sandstone and shale that support little if any vegetation.

The Vamer soil is shallow and well drained. It formed in old sediment derived dominantly from sandstone and shale. Typically, the surface layer is dark grayish brown cobbly loam 6 inches thick. The subsoil is brown clay 6 inches thick. Hard, reddish brown sandstone is at a depth of 12 inches.

Permeability of the Vamer soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for wildlife habitat, as watershed, and for livestock grazing in the less sloping areas. Some areas are used for recreation and urban development.

The included Brycan and Moreno soils are in the less sloping areas in this unit and receive extra runoff from adjacent areas. Because of this, these included soils have the potential to be major forage producers in this unit.

The potential natural plant community on the Eutroboralfs is mainly Gambel oak, mountainmahogany, mountain muhly, serviceberry, Arizona fescue, pinyon, Rocky Mountain juniper, and prairie junegrass. As the potential natural plant community deteriorates, Arizona fescue, mountainmahogany, and prairie junegrass decrease and there is an increase in Gambel oak, pinyon, Rocky Mountain juniper, blue grama, ring muhly, and threeawn, which normally occur in small amounts in the potential natural plant community.

The potential natural plant community on the Vamer soil is mainly Arizona fescue, mountain muhly, prairie junegrass, oatgrass, and needlegrass. As the potential natural plant community deteriorates, these plants decrease and there is an increase in Gambel oak, blue grama, sagewort, pinyon, and Rocky Mountain juniper,

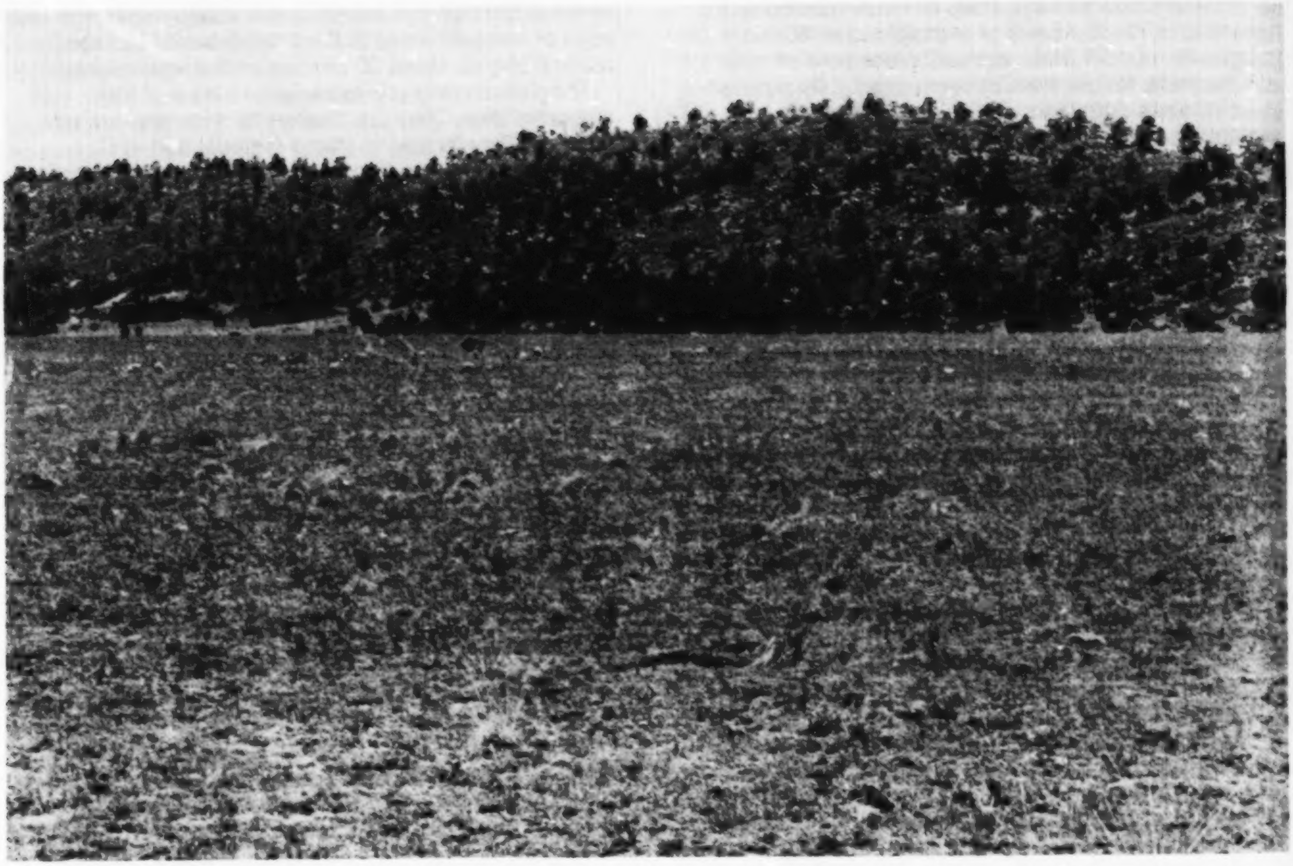

Figure 10.—Area of Eutroboralfs-Rock outcrop-Vamer complex, extremely steep, in background; in foreground is Remunda-La Vata Variant association, gently sloping.

which normally occur in small amounts in the potential natural plant community. Grazing management should be designed to increase the vigor, productivity, and reproduction of mountain muhly, Arizona fescue, and prairie junegrass.

This unit has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Eutroboralfs ranges from 1,000 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Vamer soil ranges from 1,200 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by slope, cobbles and stones on the surface, shallow soil depth, and the areas of Rock outcrop.

This unit is poorly suited to urban development. The main limitations are slope, cobbles and stones on the surface, shallow soil depth, the areas of Rock outcrop, and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

FH—Firo-Hesperus association, hilly. This map unit is on the lower part of mountainsides and in valleys.

Slope is 5 to 25 percent. Areas are irregular in shape and are 50 to 640 acres in size. The native vegetation is mainly conifers with an understory of grass. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 45 percent Firo cobbly sandy loam, 5 to 25 percent slopes, and 30 percent Hesperus sandy loam, 5 to 15 percent slopes. The Firo soil is on the lower part of mountainsides and along ridges and peaks, and the Hesperus soil is on the lower part of mountainsides and in valleys.

Included in this unit are small areas of Brycan, Moreno, and Kinesava soils in the lower valleys; Holman and Breece Variant soils and Ustifluvents along drainageways; Rocio, Fuera, Dargol, and Eutroboralfs near the edge of mapped areas; and Rock outcrop scattered throughout the unit. Included areas make up about 25 percent of the total acreage.

The Firo soil is shallow and well drained. It formed in mixed material derived dominantly from metamorphic rock. Typically, the surface layer is dark grayish brown cobbly sandy loam 7 inches thick. The subsoil is dark grayish brown very cobbly loam 7 inches thick. Hard metamorphic rock is at a depth of 14 inches.

Permeability of the Firo soil is moderate. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Hesperus soil is deep and well drained. It formed in alluvial sediment derived dominantly from metamorphic and sedimentary rocks. Typically, the upper 13 inches of the surface layer is dark brown sandy loam and the lower 5 inches is brown sandy loam. The upper 8 inches of the subsoil is brown sandy loam, the next 19 inches is brown and yellowish brown sandy clay loam, and the lower part to a depth of 60 inches or more is light yellowish brown clay loam.

Permeability of the Hesperus soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for wildlife habitat, as watershed, and for livestock grazing in the less sloping areas. Some areas are used for recreation, woodland, and Christmas trees, and a few areas have been subdivided for urban development.

The Firo soil has very limited suitability for production of ponderosa pine and Douglas-fir for timber because of slope, shallow soil depth, and the areas of Rock outcrop. The site index for ponderosa pine ranges from 45 to 56. On the basis of a site index of 50, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 2,500 cubic feet or 9,200 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 35 cubic feet or 85 board feet (International rule) per acre.

Tree growth on the Firo soil is slow. Precommercial and commercial thinnings should be used to accelerate growth of desirable trees. Seedlings are subject to high mortality rates because of exposure and droughtiness of the soil. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

The Hesperus soil is suited to the production of ponderosa pine. The site index for ponderosa pine ranges from 70 to 80. On the basis of a site index of 75, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,945 cubic feet or 26,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 52 cubic feet or 266 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on the Hesperus soil are the hazard of erosion and plant competition. Minimizing the risk of erosion is essential in harvesting timber. Roads and landings can be protected from erosion by construction of water bars and by seeding cuts and fills. Precommercial and commercial thinnings should be used to accelerate growth of desirable trees. Reforestation must be carefully managed to reduce competition from undesirable understory plants.

The Hesperus soil has limited suitability for production of Christmas trees. The main limitation is the increased risk of erosion when the soil is tilled for planting. Trees suitable for planting for Christmas trees are blue spruce and white fir. Trees require pruning yearly to form a dense, conical shape.

The potential understory vegetation on the Firo soil is mainly mountain muhly, prairie junegrass, needlegrass, and Gambel oak. This soil has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope.

The potential understory vegetation on the Hesperus soil is mainly mountain muhly, pine dropseed, prairie junegrass, big bluestem, needlegrass, little bluestem, and Gambel oak. As the plant community deteriorates, the palatable grasses decrease and there is an increase in Gambel oak, blue grama, and sagewort, which normally occur in small amounts in the potential plant community.

Grazing management on this unit should be designed to increase the productivity and reproduction of mountain muhly, pine dropseed, prairie junegrass, and needlegrass. Maximum understory production can be obtained by selectively thinning and by reducing density of the canopy to a desirable level.

The Hesperus soil has limited suitability for rangeland management practices such as installation of livestock watering facilities, mechanical brush management, and rangeland seeding because of the seepage potential, wooded areas, and the hazard of water erosion. Effective livestock distribution can be accomplished by proper placement of fences and salt.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry understory vegetation on the Firo soil ranges from 700 pounds per acre in favorable years to 200 pounds in unfavorable years.

The average annual production of air-dry understory vegetation on the Hesperus soil ranges from 900 pounds per acre in favorable years to 400 pounds in unfavorable years.

The Firo soil is poorly suited to recreational development. The main limitations are cobbles on the surface, slope, and bedrock at a depth of 7 to 20 inches. The Hesperus soil is well suited to recreational development. It is limited mainly by slope in the steeper areas.

The Firo soil is poorly suited to urban development. The main limitations are bedrock at a depth of 7 to 20 inches and slope. The Hesperus soil is well suited to urban development. It is limited mainly by slope.

FR—Firo-Rock outcrop complex, extremely steep. This map unit is on mountainsides and canyon walls and along ridges and peaks. Slope is 30 to 55 percent. Areas are irregular in shape and are 100 to 640 acres in size. The native vegetation is mainly scattered ponderosa pine with an understory of pinyon, brush, and shrubs. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 35 percent Firo very stony loam, 30 to 55 percent slopes, and 35 percent Rock outcrop. The Firo soil is on mountainsides throughout the unit, and Rock outcrop consists of ledges, ridges, peaks, and vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Brycan, Hesperus, Kinesava, and Moreno soils in narrow valleys; Dargol, Fuera, and Vamer soils and Eutroboralfs near the edge of mapped areas; Holman soils and Ustifluvents along and in drainageways; and Breece Variant soils on fans. Included areas make up about 30 percent of the total acreage.

The Firo soil is shallow and well drained. It formed in mixed material derived dominantly from metamorphic rock. Typically, the surface layer is covered with a mat of decomposing leaves, needles, and woody twigs 2 inches thick. The surface layer is dark grayish brown very stony loam 3 inches thick. The subsoil is dark grayish brown very cobbly clay loam 8 inches thick. Metamorphosed sandstone and other metamorphic rock are at a depth o 11 inches.

Permeability of the Firo soil is moderate. Available water capacity is very low. Effective rooting depth is 7 t 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop is exposed areas of metamorphic gneiss, schist, quartz, and mica that support little if any vegetation.

This unit is used mainly for wildlife habitat and watershed. Some of the less sloping areas have been used as woodland and for livestock grazing. Some area are used for recreation and urban development.

The included Brycan, Hesperus, Kinesava, and Moreno soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potentia to be major forage producers in this unit.

The Firo soil has very limited suitability for production of ponderosa pine and Douglas-fir for timber because o slope, shallow soil depth, and the areas of Rock outcro The site index for ponderosa pine ranges from 45 to 52 On the basis of a site index of 50, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 2,500 cubic feet or 9,200 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 35 cubic feet or 85 board feet (International rule) per acre.

Growth of trees on the Firo soil is slow. Precommerci and commercial thinnings should be used to accelerate growth of desirable trees. Seedlings are subject to high mortality rates because of exposure and the shallow, droughty soil profile. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality. The steepnes of slope limits the kinds of equipment that can be used in forest management. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging.

The potential understory vegetation on the Firo soil i mainly prairie junegrass, Arizona fescue, mountain muh and Gambel oak. The soil has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope.

The average annual production of air-dry understory vegetation on the Firo soil ranges from 700 pounds pe acre in favorable years to 200 pounds in unfavorable years.

This unit is poorly suited to recreational developmen The main limitations are slope, shallow soil depth, and the areas of Rock outcrop.

This unit is poorly suited to urban development. The main limitations are slope, shallow soil depth, stones on the surface, and the areas of Rock outcrop.

FU—Fuera-Dargol association, very steep. This map unit is on mountainsides. Slope is 25 to 55 percent. Areas are irregular in shape and are 100 to 640 acres in size. The native vegetation is mainly conifers. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 19 inches, the average annual air temperature is 38 to 46 degrees F, and the average frost-free period is 85 to 110 days.

This unit is 45 percent Fuera cobbly loam, 25 to 55 percent slopes, and 35 percent Dargol stony loam, 25 to 45 percent slopes. The Fuera soil is in the steeper areas at the higher elevations, mainly on north- and west-facing side slopes, and the Dargol soil is in the less sloping areas at the lower elevations, mainly on south- and east-facing side slopes.

Included in this unit are small areas of Brycan and Moreno soils in narrow valleys; Etoe, Etown, and Maes soils near the edge of mapped areas at the higher elevations; Firo, Vamer, and Rocio soils and Eutroboralfs near the edge of mapped areas at the lower elevations; Holman soils along drainageways; and Rock outcrop scattered throughout the unit. Included areas make up about 20 percent of the total acreage.

The Fuera soil is deep and well drained. It formed in colluvial and alluvial material derived dominantly from sandstone and shale. Typically, the surface is covered with a mat of forest litter 1 inch thick. The surface layer is dark grayish brown cobbly loam 3 inches thick. The subsurface layer is light brown cobbly fine sandy loam 11 inches thick. The upper 25 inches of the subsoil is light brown and brown cobbly clay and clay, and the lower part to a depth of 60 inches or more is brown very cobbly clay.

Permeability of the Fuera soil is slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Dargol soil is moderately deep and well drained. It formed in fine textured material derived from shale and sandstone. Typically, the surface layer is dark brown stony loam 5 inches thick. The upper 8 inches of the subsoil is pale brown stony clay loam, and the lower 24 inches is light brown and brown clay. Hard, metamorphosed sandstone is at a depth of 37 inches.

Permeability of the Dargol soil is very slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. Some of the less sloping areas are used for livestock grazing. Some areas are used for recreation and urban development.

The included Brycan and Moreno soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The Fuera soil is suited to the production of Douglas-fir, white fir, and ponderosa pine for timber and Christmas trees. It is limited mainly by slope and cobbles on the surface. The site index for Douglas-fir ranges from 45 to 65. On the basis of a site index of 60, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 3,570 cubic feet or 14,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 39 cubic feet or 130 board feet (International rule) per acre. Timber production on this soil is slow. Precommercial and commercial thinnings should be used to accelerate growth of desirable trees.

The Dargol soil is suited to the production of ponderosa pine and Douglas-fir for timber and to the production of white fir for timber and Christmas trees. The site index for ponderosa pine ranges from 55 to 70. On the basis of a site index of 58, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 3,570 cubic feet or 22,000 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 39 cubic feet or 146 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on this unit are the hazard of water erosion, equipment limitations, and seedling mortality. Minimizing the risk of water erosion is essential in harvesting timber. Roads and landings can be protected from water erosion by constructing water bars and by seeding cuts and fills. The steepness of slope limits the kinds of equipment that can be used in forest management. Stones and cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

The included Etown and Maes soils in this unit have a higher site index for Douglas-fir than the Fuera soil, and the included Etoe soils have a higher site index for ponderosa pine than the Dargol soil. Because of this, these included soils have a significant potential for production of timber in small areas of this unit.

The potential understory vegetation on this unit is mainly mountain muhly, Arizona fescue, and kinnikinnick. The unit has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope.

The average annual production of air-dry understory vegetation on this unit ranges from 700 pounds per acre in favorable years to 400 pounds in unfavorable years.

This unit is poorly suited to recreational development. The Fuera soil is limited mainly by cobbles on the surface and slope, and the Dargol soil is limited mainly by stones on the surface and slope.

This unit is poorly suited to urban development. The main limitations of the Fuera soil are cobbles on the surface and in the soil, slope, and a high shrink-swell potential during alternate periods of wetting and drying. The main limitations of the Dargol soil are stones on the surface and in the soil, bedrock at a depth of 20 to 40 inches, slope, and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

HA—Haplustolls-Rock outcrop complex, extremely steep. This map unit is on side slopes and benches in deeply cut sandstone canyons. Slope is 40 to 75 percent. Areas are irregular in shape and are 100 to 640 acres in size. The native vegetation is mainly brush and scattered pinyon and oneseed juniper. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 40 percent Haplustolls very stony sandy loam, 40 to 65 percent slopes, and 35 percent Rock outcrop. The Haplustolls are on benches and side slopes, and Rock outcrop occurs as ledges, sheets, and tall vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bernal and Carnero soils at the higher elevations, Manzano and Partri soils at the lower elevations, Tuloso and Sombordoro soils in the less sloping areas throughout the unit, and Argiustolls and Eutroboralfs near the edge of mapped areas. Included areas make up about 25 percent of the total acreage.

The Haplustolls are extremely variable in their characteristics. They are shallow to deep and are well drained. They formed in mixed material derived dominantly from sandstone and shale. Typically, the surface layer is recently deposited brown very stony sandy loam 4 inches thick. Below this is a buried surface layer of stratified, dark grayish brown very cobbly sandy loam and grayish brown very cobbly loam 16 inches thick. The substratum to a depth of 60 inches or more is brown extremely cobbly sandy clay loam with common strata of sandy loam and loam.

Permeability of the Haplustolls is moderately rapid to very slow. Available water capacity is very low to high. Effective rooting depth is 10 to 60 inches or more. Runoff is very rapid, and the hazard of water erosion is very high. The hazard of soil blowing is slight.

Rock outcrop is exposed areas of sandstone and shale that support little if any vegetation.

This unit is used mainly for wildlife habitat and watershed. It is also used for some livestock grazing in the less sloping areas. Some areas are used for recreation and urban development.

The included Manzano and Partri soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on this unit is mainly little bluestem, sideoats grama, blue grama, and pinyon. As the potential natural plant community deteriorates, little bluestem, sideoats grama, and the blue grama decrease and there is an increase in pinyon, oneseed juniper, and Gambel oak, which normally occur in small amounts in the potential natural plant community.

This unit has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited.

The average annual production of air-dry vegetation on this unit ranges from 1,200 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by slope, areas of Rock outcrop, and stones on the surface.

This unit is poorly suited to urban development. The main limitations are slope, areas of Rock outcrop, stones on the surface, and cobbles in the soil.

Hb—Hesperus sandy loam, 1 to 3 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in alluvial sediment derived dominantly from metamorphic and sedimentary rocks. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is brown sandy loam 12 inches thick. The upper 10 inches of the subsoil is brown light clay loam, the next 11 inches is brown clay loam, and the lower 11 inches is brown sandy clay loam. The substratum to a depth of 64 inches or more is light brown sandy clay loam.

Included in this unit are small areas of Brycan and Moreno soils near the edge of mapped areas, Ceboya soils in the lower areas near the edge of mapped areas, Kinesava soils in slightly concave areas, and Breece Variant and Holman soils and Ustifluvents along drainageways. Included areas make up about 20 percent

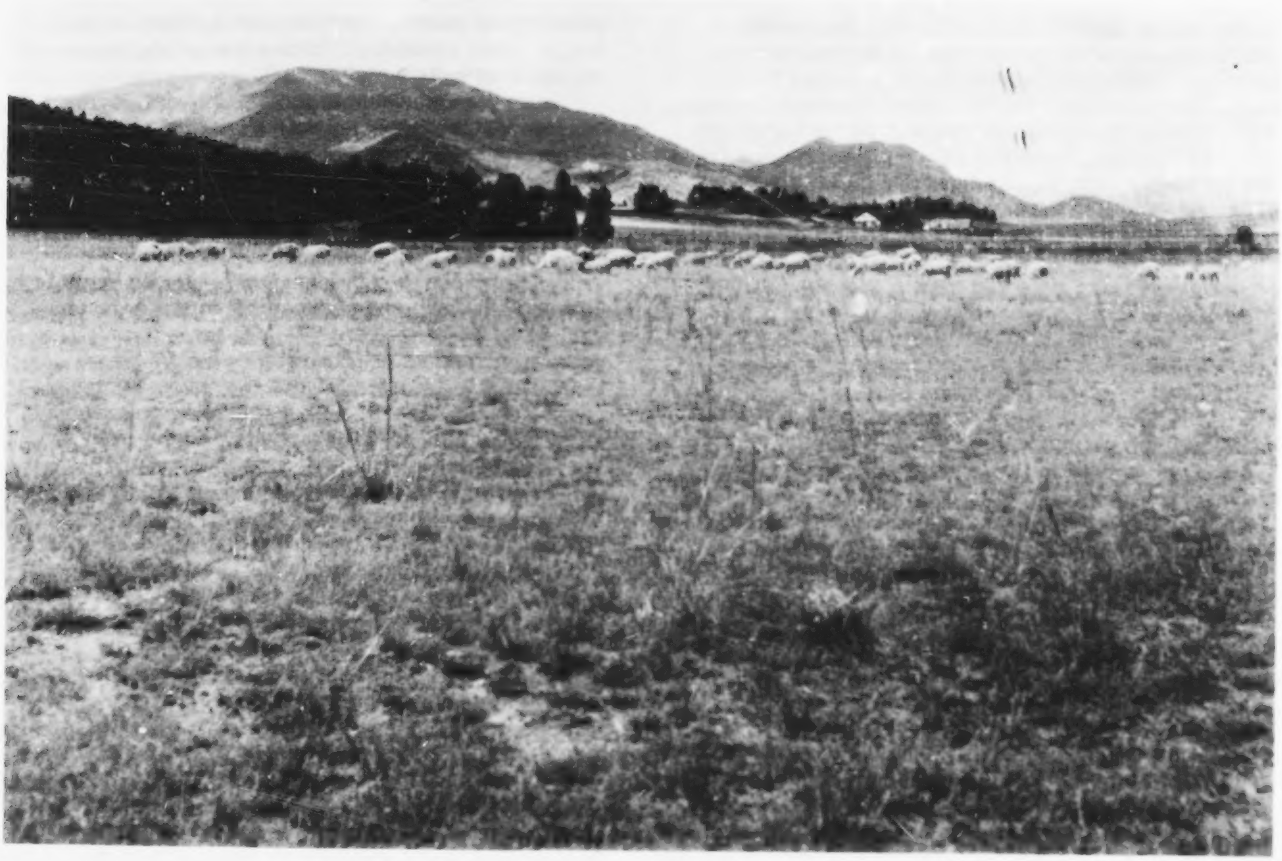

Figure 11.—Sheep grazing on Hesperus sandy loam, 1 to 3 percent slopes.

of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Hesperus soil is moderately slow. Available water capacity is high. Effective rooting depth is 64 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing (fig. 11), wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly mountain muhly, Arizona fescue, mountain brome, pine dropseed, and western wheatgrass. As the potential natural plant community deteriorates, the desirable forage plants decrease and there is an increase in pingue, cinquefoil, blue grama, and sagewort, which normally occur in small amounts in the potential natural plant community. Kentucky bluegrass and sleepygrass readily invade. Ponderosa pine from the adjacent woodland soils also invade this unit.

Grazing management should be designed to increase the productivity and reproduction of mountain muhly, Arizona fescue, and mountain brome. Grazing should be delayed until the soil in this unit is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain brome, and mountain muhly. Sageworts and cinquefoil can be controlled by hand operations or by chemicals. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has been formed in the unit by water erosion.

The average annual production of air-dry vegetation on this unit ranges from 2,500 pounds per acre in favorable years to 1,400 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and water erosion.

The water table in this unit is at a depth of more than 6 feet under normal conditions. Irrigation water should be applied carefully to prevent the buildup of a high water table. Seepage from irrigation ditches can also contribute to a rise in the level of the water table. Line ditches or irrigation pipelines to reduce water loss by seepage.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is well suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from water erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilization helps to maintain or increase yields. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphorus.

This unit has limited suitability for Christmas trees. The main limitation is the increased risk of water erosion when the soil is tilled for planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees require pruning yearly to form a dense, conical shape. Trees suited to Christmas tree production on this unit are blue spruce and white fir.

This unit is well suited to recreational development. It has few limitations.

This unit is well suited to urban development. It has few limitations.

Hc—Hesperus sandy loam, 3 to 8 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in alluvial sediment derived dominantly from metamorphic and sedimentary rocks. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is dark grayish brown sandy loam 10 inches thick. The upper 22 inches of the subsoil is dark grayish brown loam, and the lower 18 inches is brown sandy clay loam. The substratum to a depth of 60 inches or more is brown loam.

Included in this unit are small areas of Brycan and Moreno soils near the edge of mapped areas; Ceboya soils in the lower areas near the edge of mapped areas; Holman and Breece Variant soils and Ustifluvents along drainageways; Kinesava soils in slightly concave areas; and Krakon, Dargol, and Firo soils in the steeper areas near the edge of mapped areas. Included areas make up about 25 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Hesperus soil is moderate. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly mountain muhly, prairie junegrass, Arizona fescue, little bluestem, western wheatgrass, and needleandthread. As the potential natural plant community deteriorates, the desirable forage plants such as mountain muhly, prairie junegrass, and Arizona fescue decrease and there is an increase in blue grama, ring muhly, Gambel oak, sagewort, and cinquefoils, which normally occur in small amounts in the potential natural plant community. Sleepygrass readily invades. Ponderosa pine from the adjacent woodland soils easily increases or invades this unit. In some areas dense stands of ponderosa pine have become established. A limited wood crop can be produced in these areas if proper woodland management is used.

Grazing management should be designed to increase the vigor, productivity, and reproduction of mountain muhly, Arizona fescue, and prairie junegrass. Grazing should be delayed until the soil in this unit is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain muhly, and prairie junegrass. Sageworts, Gambel oak, and cinquefoils can be controlled by hand operations or by chemicals. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 1,800 pounds per acre in favorable years to 1,000 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and water erosion.

The water table in this unit is at a depth of more than 6 feet under normal conditions. Irrigation water should be applied carefully to prevent the buildup of a high water table. Seepage from irrigation ditches can also contribute to a rise in the level of the water table. Line ditches or irrigation pipelines to reduce water loss by seepage.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum. Terracing and contour farming reduce runoff and the risk of erosion and help to conserve moisture. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from water erosion. Fertilization helps to maintain or increase yields. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

This unit has limited suitability for Christmas tree production. The main limitation is the increased risk of water erosion when the soil is tilled for planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees require pruning yearly to form a dense, conical shape. Trees suited to Christmas tree production on this unit are blue spruce and white fir.

This unit is well suited to recreational development. It is limited mainly by slope in some areas.

This unit is well suited to urban development. It is limited mainly by slope in some areas.

Ho—Holman complex, 3 to 5 percent slopes. This map unit is on nearly level to undulating flood plains and bench terraces along major drainageways in mountain valleys. Areas are long and narrow in shape and are 5 to 100 acres in size. The native vegetation is mainly grass and conifers. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 100 days.

This unit is 40 percent Holman very cobbly sandy loam, 3 to 5 percent slopes, and 40 percent Holman extremely cobbly sandy loam, 3 to 5 percent slopes. The Holman very cobbly sandy loam is in grassed areas, and the Holman extremely cobbly sandy loam is in areas that are wooded and have an understory of grass. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. Percentages vary from one area to another.

Included in this unit are small areas of Brycan, Ceboya, Hesperus, Kinesava, Moreno, and Breece Variant soils near the edge of mapped areas and Ustifluvents scattered throughout the unit. Included areas make up about 20 percent of the total acreage.

The Holman very cobbly sandy loam is deep and excessively drained. It formed in coarse textured material derived from various kinds of rock. Typically, the upper 10 inches of the surface layer is very dark grayish brown very cobbly sandy loam and the lower 4 inches is brown very cobbly loamy sand. The upper 10 inches of the substratum is yellowish brown extremely cobbly sand, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly coarse sand.

Permeability of the Holman very cobbly sandy loam is moderately rapid in the surface and very rapid in the substratum. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is high. Rare periods of flooding can occur during rainfall and runoff.

The Holman extremely cobbly sandy loam is deep and excessively drained. It formed in coarse textured material derived dominantly from various kinds of rock. Typically, the surface layer is very dark grayish brown extremely cobbly sandy loam 12 inches thick. The upper 8 inches of the substratum is brown extremely cobbly loamy sand, and the lower part to a depth of 60 inches or more is yellowish brown extremely cobbly sand.

Permeability of the Holman extremely cobbly sandy loam is rapid in the surface and very rapid in the substratum. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is very slow, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. Rare periods of flooding can occur during rainfall and runoff.

Most areas of this unit are used for livestock grazing, wildlife habitat, and watershed. A few areas are used as woodland, for recreation and urban development, and as cropland. Some areas are used as a source of sand and gravel. The main crops are pasture and grass hay.

This unit has potential as a source of sand and gravel. The material commonly is stratified and separating operations are usually required.

The potential natural plant community on the Holman very cobbly sandy loam is mainly mountain muhly, prairie junegrass, oatgrass, and needlegrass. As the potential natural plant community deteriorates, these plants decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, pingue, and sagewort increase, and Kentucky bluegrass and sleepygrass invade. Coniferous trees from the adjacent woodland soils invade this soil.

Grazing management should be designed to increase the vigor, productivity, and reproduction of mountain muhly, junegrass, and oatgrass. In some areas dense stands of coniferous trees have become established. A limited wood crop can be produced in these areas if proper woodland management is used.

The Holman very cobbly sandy loam is poorly suited to such rangeland management practices as rangeland seeding, mechanical brush management, fencing, and installing watering facilities and pipelines for providing stock water because of the very cobbly surface layer, extremely cobbly substratum, and a high seepage potential.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Holman very cobbly sandy loam ranges from 1,800 pounds per acre in favorable years to 1,000 pounds in unfavorable years.

Areas of the Holman very cobbly sandy loam at the lower elevations are suited to the production of ponderosa pine. On the basis of a site index of 74 for ponderosa pine, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,852 cubic feet or 26,600 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 60 cubic feet or 125 board feet (International rule) per acre.

Areas of the Holman extremely cobbly sandy loam at the higher elevations are suited to the production of Englemann spruce for timber. On the basis of a site index of 92 for Englemann spruce, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,190 cubic feet or 14,950 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 60 cubic feet or 125 board feet (International rule) per acre.

Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Conventional methods of harvesting timber can be used. An undisturbed buffer or filter strip should be left along all watercourses in areas of the Holman extremely cobbly sandy loam to reduce sedimentation and maintain water quality.

The potential understory vegetation on the Holman extremely cobbly sandy loam is mainly mountain brome, nodding brome, oatgrass, and sedges. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

The average annual production of air-dry understory vegetation on the Holman extremely cobbly sandy loam ranges from 1,300 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is poorly suited to irrigated or nonirrigated crops. The very cobbly and extremely cobbly surface layer and rare periods of flooding limit the use of this unit for crops.

This unit is poorly suited to recreational development. It is limited mainly by cobbles on the surface and rare periods of flooding.

This unit is poorly suited to urban development. The main limitations are cobbles on the surface and in the soil and rare periods of flooding.

Ka—Kinesava sandy loam, 3 to 8 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in alluvial sediment derived from various kinds of rock. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the surface layer is dark grayish brown sandy loam 21 inches thick. The upper 21 inches of the subsoil is dark grayish brown and light reddish brown clay loam, the next 11 inches is reddish brown clay, and the lower 10 inches is reddish brown clay loam. The substratum to a depth of 75 inches or more is reddish brown clay loam.

Included in this unit are small areas of Brycan and Moreno soils near the edge of mapped areas; Hesperus and Kinesava loam scattered throughout the unit; Krakon, Dargol, and Firo soils on low hills and in the steeper areas near the edge of mapped areas; and Breece Variant and Holman soils and Ustifluvents adjacent to drainageways. Included areas make up about 25 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Kinesava soil is moderately rapid in the upper part of the profile and slow in the lower part. Available water capacity is high. Effective rooting depth is 75 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly mountain muhly, prairie junegrass, Arizona fescue, little bluestem, western wheatgrass, and needleandthread. As the potential natural plant community deteriorates, the desirable forage plants such as mountain muhly, prairie junegrass, and Arizona fescue decrease and there is an increase in blue grama, ring muhly, Gambel oak, sagewort, and cinquefoils, which normally occur in small amounts in the potential natural plant community. Sleepygrass readily invades. Ponderosa pine from the adjacent woodland soils readily increases or invades this soil. In some areas dense stands of ponderosa pine have become established. A limited wood crop can be produced in these areas if proper woodland management is used.

Grazing management should be designed to increase the productivity and reproduction of mountain muhly, Arizona fescue, and prairie junegrass. Grazing should be delayed until the soil in this unit is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain muhly, and prairie junegrass. Sageworts, Gambel oak, and cinquefoils can be controlled by hand operations or by chemicals. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of erosion.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 800 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and water erosion. Line ditches or irrigation pipelines to reduce water loss by seepage.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum. Terracing and contour farming reduce runoff and the risk of water erosion and help to conserve moisture. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from water erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilization helps to maintain or increase yields. Most crops, except legumes, respond to nitrogen. Legumes respond to phosphorus.

This unit is suited to Christmas tree production. The main limitation is the increased risk of water erosion when the soil is tilled for planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees will require pruning yearly to form a dense, conical shape. Trees suited to Christmas tree production on this unit are Scotch pine and blue spruce.

This unit is well suited to recreational development. It is limited mainly by slope in some areas.

This unit is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

Kb—Kinesava loam, 1 to 3 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in alluvial sediment derived from various kinds of rock. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 41 to 45 degrees F, and the average frost-free period is 90 to 110 days.

Typically, the upper 20 inches of the surface layer is dark brown loam and the lower 9 inches is dark grayish brown loam. The upper 9 inches of the subsoil is grayish brown clay loam, the next 22 inches is grayish brown and light brownish gray clay, and the lower part to a depth of 70 inches or more is reddish yellow clay loam.

Included in this unit are small areas of Brycan, Ceboya, and Moreno soils near the edge of mapped areas, Hesperus and Kinesava sandy loams scattered throughout the unit, and Holman and Breece Variant soils and Ustifluvents along drainageways. Included areas make up about 20 percent of the total acreage. Individual areas of included soils are generally less than 1 to 3 acres in size.

Permeability of the Kinesava soil is moderate in the upper part and slow in the lower part. Available water capacity is very high. Effective rooting depth is 70 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated and nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreational and urban development.

The potential natural plant community on this unit is mainly mountain muhly, Arizona fescue, mountain brome, pine dropseed, and western wheatgrass. As the potential natural plant community deteriorates, the desirable forage plants decrease and there is an increase in pingue, cinquefoil, blue grama, and sageworts that normally occur in small amounts in the potential natural plant community. Kentucky bluegrass and sleepygrass readily invade. Ponderosa pine from the adjacent woodland soils readily increases or invades.

Grazing management should be designed to increase the productivity and reproduction of mountain muhly, Arizona fescue, and mountain brome. Grazing should be delayed until the soil in this unit is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted species suitable for seeding include improved varieties of Arizona fescue, mountain brome, and mountain muhly. Sageworts and cinquefoil can be controlled by hand operations or by chemicals. Practices that facilitate rangeland management such as installation of fences, pipelines for providing water for livestock, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is reduced in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 2,300 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing deep percolation, runoff, and erosion. Line ditches or install irrigation pipelines to reduce water loss by seepage.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Tillage should be kept to a minimum. Unless this unit is irrigated, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is well suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain or increase yields. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

This unit is suitable for Christmas tree production. The main limitation is the increased risk of erosion when the soil is tilled for planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees require pruning yearly to form a dense conical shape. Trees suited to Christmas tree production on this unit are Scotch pine and blue spruce.

This unit is well suited to recreational development. It has few limitations.

This unit is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

KR—Krakon-Rock outcrop complex, hilly. This map unit is on mountainsides and foothills. Slope is 5 to 25 percent. Areas are irregular in shape and are 20 to 300 acres in size. The native vegetation is mainly oak, but grass is in open areas. Elevation is 7,500 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 85 to 110 days.

This unit is 55 percent Krakon clay loam, 5 to 25 percent slopes, and 25 percent Rock outcrop. The Krakon soil is throughout the unit, and Rock outcrop occurs as ledges, sheets, and ridges throughout the unit. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Breece Variant, Brycan, Hesperus, Holman, Kinesava, and Moreno soils in narrow valleys. Also included are small areas of Dargol, Etoe, Firo, Fuera, and Vamer soils and Eutroboralfs near the edge of mapped areas. Included areas make up about 20 percent of the total acreage.

The Krakon soil is shallow and well drained. It formed in mixed material derived dominantly from shale. Typically, the surface layer is very dark gray clay loam 6 inches thick. The next layer is very dark gray clay loam 8 inches thick. The upper 3 inches of the substratum is black and dark grayish brown clayey shale, and the lower part to a depth of 60 inches or more is black and dark grayish brown shale with thin strata of mudstone and calcareous limestone.

Permeability of the Krakon soil is moderately slow. Available water capacity is very low. Effective rooting depth is 8 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of shale that supports little if any vegetation.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The included Breece Variant, Brycan, Hesperus, Holman, Kinesava, and Moreno soils receive extra runoff from adjacent areas and are in the less sloping areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on this unit is mainly Gambel oak, mountain muhly, Arizona fescue, western wheatgrass, mountainmahogany, prairie junegrass, and serviceberry. As the potential natural plant community deteriorates, the desirable forage plants such as Arizona fescue, western wheatgrass, and prairie junegrass decrease and there is an increase in Gambel oak, blue grama, threeawn, sleepygrass, cinquefoil, and Rocky Mountain juniper, which normally occur in small amounts in the potential natural plant community. Ring muhly, pingue, rabbitbrush, and Kentucky bluegrass easily invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of Arizona fescue, western wheatgrass, and prairie junegrass.

Mechanical treatment practices are not practical because of slope and the depth to shale in the Krakon soil. Practices that facilitate rangeland management such as fencing and providing livestock watering facilities are difficult to apply on this unit because of the shallow depth to shale and the areas of Rock outcrop. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines, tanks, and salt. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,200 pounds per acre in favorable years to 500 pounds in unfavorable years.

This unit is poorly suited to recreational and urban development. The main limitations are shallow soil depth, the areas of Rock outcrop, and slope.

La—La Brier silty clay loam, 0 to 3 percent slopes. This deep, well drained soil is in concave areas on valley sides, on flood plains, and in swales. It formed in alluvium derived dominantly from sandstone and basalt. Areas are long and narrow in shape and are 10 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is brown silty clay loam 6 inches thick. The upper 30 inches of the subsoil is brown clay, and the lower 14 inches is pinkish gray clay loam. The substratum to a depth of 60 inches or more is pinkish gray clay loam.

Included in this unit are small areas of Manzano and Vermejo soils near the edge of mapped areas, Partri and Swastika soils near the edge of mapped areas on the upper part of side slopes, Torreon soils on the upper part of side slopes in the vicinity of Maxson Crater, and Ustifluvents on the lower flood plains along drainageways. Included areas make up about 15 percent of the total acreage. Individual areas of included soils are generally less than 1 to 3 acres in size.

Permeability of the La Brier soil is very slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is slight. The hazard of soil blowing is moderate. This soil is subject to rare periods of flooding.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated and nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. Some areas are used for recreational and urban development.

The potential natural plant community on this unit is mainly alkali sacaton, western wheatgrass, vine-mesquite, galleta, and blue grama. As the potential natural plant community deteriorates, western wheatgrass, vine-mesquite, and galleta decrease and the blue grama forms a dense, low turf. Species that occur in the potential natural plant community in smaller amounts such as mat muhly, ring muhly, and threeawn increase and sleepygrass and rabbitbrush invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, vine-mesquite, and alkali sacaton.

Rangeland seeding is a suitable practice. Adapted species suitable for seeding include improved varieties of western wheatgrass, blue grama, vine-mesquite, and alkali sacaton. Practices that facilitate rangeland management such as installation of fences, providing livestock watering facilities, and earthen ponds are suited to this unit. This unit is suited to such rangeland management practices as mechanical brush management. Other suitable management practices are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is reduced in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 2,500 pounds per acre in favorable years to 1,100 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion and rare periods of flooding during high rainfall. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method. It permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimum production without increasing runoff and erosion.

Unless the unit is irrigated, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain soil tilth and organic matter content. Rare periods of flooding can occur during periods of high rainfall and runoff. Tillage should be kept to a minimum.

This unit is suited to hay and pasture. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

Under normal conditions, the water table in this unit is at a depth of more than 6 feet. Irrigation water should be applied carefully to prevent the buildup of a high water table. Seepage from irrigation ditches can also contribute to a rise in the level of the water table. Line ditches or install irrigation pipelines to reduce water loss by seepage.

This unit is suited to recreational development. It is limited mainly by very slow permeability and rare periods of flooding.

This unit is poorly suited to urban development. The main limitations are a high shrink-swell potential during alternate periods of wetting and drying and the rare periods of flooding. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential.

LM—Litle-Mion association, moderately sloping. This map unit is on upland hillsides and along ridges. Slope is 3 to 15 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 45 percent Litle clay loam, 3 to 9 percent slopes, and 30 percent Mion silty clay loam, 3 to 15 percent slopes. The Litle soil is on the lower, less sloping hillsides, and the Mion soil is on the steeper hillsides and along ridges.

Included in this unit are small areas of Colmor and Swastika soils at the base of hills near the edge of mapped areas, Mion flaggy silt loam and Mion very flaggy silt loam scattered throughout the unit on the upper part of hillsides, Penrose and Penrose Variant soils near the edge of mapped areas, Rock outcrop scattered throughout the unit, Tinaja soils on terrace remnants along drainageways, and Vermejo soils in swales. Included areas make up about 25 percent of the total acreage.

The Litle soil is moderately deep and well drained. It formed in residuum derived from shale. Typically, the surface layer is grayish brown clay loam 6 inches thick. The subsoil is grayish brown clay 19 inches thick. The substratum is grayish brown silty clay 11 inches thick over grayish brown and pale brown, calcareous shale.

Permeability of the Litle soil is very slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

The Mion soil is shallow and well drained. It formed in fine textured material derived dominantly from shale. Typically, the surface layer is grayish brown silty clay loam 4 inches thick. The underlying material is light olive brown clay 11 inches thick. Light olive brown and olive brown, calcareous shale is at a depth of 15 inches.

Permeability of the Mion soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The included Colmor, Swastika, and Vermejo soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on the Litle soil is mainly blue grama, western wheatgrass, galleta, alkali sacaton, and sideoats grama. As the potential natural plant community deteriorates, these plants decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, broom snakeweed, and pricklypear increase and oneseed juniper and cholla invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, blue grama, and alkali sacaton.

The Litle soil has limited suitability for rangeland management practices such as rangeland seeding and mechanical brush management because of the hazard of water erosion. Management of oneseed juniper and cholla can be controlled by hand operations or by chemicals. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, tanks, and salt. This soil is limited for livestock watering ponds and other water impoundments because of the shale at a depth of 20 to 40 inches.

The potential natural plant community on the Mion soil is mainly sideoats grama, blue grama, little bluestem, and New Mexico feathergrass. As the potential natural plant community deteriorates, sideoats grama and New Mexico feathergrass decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as threeawn, ring mulhy, broom snakeweed, and oneseed juniper increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, little bluestem, and New Mexico feathergrass.

Loss of the surface layer results in a severe decrease in productivity and in the potential of the Mion soil to produce plants suitable for grazing. The Mion soil is poorly suited to such rangeland management practices as rangeland seeding and mechanical brush management because of the shale at a depth of 10 to 20 inches. Oneseed juniper can be controlled by hand operation or by chemicals. Practices that facilitate rangeland management such as fencing and pipelines for providing stock water are difficult to apply on the Mion soil because of the shale at a depth of 10 to 20 inches.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Litle soil ranges from 1,200 pounds per acre in favorable years to 600 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Mion soil ranges from 1,000 pounds per acre in favorable years to 400 pounds in unfavorable years.

The Litle soil is suited to recreational development. It is limited mainly by the clayey texture of the soil. The Mion soil is poorly suited to recreational development. It is limited mainly by shale at a depth of 10 to 20 inches.

The Litle soil is suited to urban development. The main limitations are shale at a depth of 20 to 40 inches and a high shrink-swell potential during alternate periods of wetting and drying. The Mion soil is poorly suited to urban development. It is limited mainly by shale at a depth of 10 to 20 inches and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

MA—Maes-Etoe complex, hilly. This map unit is on mountainsides and benches. Slope is 5 to 25 percent. Areas are irregular in shape and are 80 to 640 acres in size. The native vegetation is mainly conifers. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 19 to 26 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is less than 90 days.

This unit is 40 percent Maes cobbly loam and 40 percent Etoe very cobbly sandy loam. The Maes soil is at the higher elevations, and the Etoe soil is at the lower elevations. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cundiyo soils near the edge of mapped areas at the higher elevations; Etoe cobbly loam, Maes very cobbly loam, and Rock outcrop scattered throughout the unit; Holman soils in the lower lying, narrow valleys; Moreno and Brycan soils in the higher lying, narrow valleys; and Rocio, Dargol, and Fuera soils near the edge of mapped areas at the lower elevations. Included areas make up about 20 percent of the total acreage.

The Maes soil is deep and well drained. It formed in mixed material derived dominantly from sandstone and shale. Typically, the surface layer is dark brown cobbly loam 5 inches thick. The subsurface layer is light yellowish brown cobbly sandy loam 19 inches thick. The upper 11 inches of the subsoil is brownish yellow very cobbly sandy clay, the next 9 inches is light yellowish brown very cobbly clay loam, and the lower 12 inches is brownish yellow very cobbly sandy clay loam. The substratum to a depth of 60 inches or more is very pale brown very cobbly loam.

Permeability of the Maes soil is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Etoe soil is deep and well drained. It formed in alluvial and colluvial material derived dominantly from sandstone and shale. Typically, the surface layer is brown very cobbly sandy loam 6 inches thick. The upper 14 inches of the subsurface layer is very pale brown very cobbly sandy loam, and the lower 13 inches is light yellowish brown very cobbly sandy loam. The upper 13 inches of the subsoil is pale brown very cobbly sandy clay loam, and the lower part to a depth of 60 inches or more is brownish yellow very cobbly sandy clay loam.

Permeability of the Etoe soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. A few areas where understory vegetation is present are used for livestock grazing. Some areas are used for recreational and urban development.

This unit is suited to the production of Douglas-fir, white fir, and ponderosa pine for timber and Christmas trees. The site index for Douglas-fir ranges from 62 to 70. On the basis of a site index of 70, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,480 cubic feet or 22,000 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 53 cubic feet or 174 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on this unit are a hazard of water erosion, equipment limitations, and plant competition. Minimizing the risk of water erosion is essential in harvesting timber. Proper design of road drainage systems and care in the placement of culverts help to control water erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. The steepness of slope in some areas limits the kinds of equipment that can be used in forest management; however, conventional methods of harvesting timber can normally be used. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Among the trees that are suitable for planting are Douglas-fir and white fir.

Competing vegetation can be controlled by properly preparing the site and by spraying, cutting, or girdling to eliminate unwanted weeds, brush, or trees. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

This unit is poorly suited to recreational development. It is limited mainly by cobbles on the surface and slope.

The Maes soil is poorly suited to urban development. The main limitations are slope, cobbles on the surface and in the soil, and a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The Etoe soil is poorly suited to urban development. The main limitations are slope and cobbles on the surface and in the soil.

MB—Maes-Etoe complex, extremely steep. This map unit is on mountainsides and benches. Slope is 30 to 70 percent. Areas are irregular in shape and are 80 to 640 acres in size. The native vegetation is mainly conifers. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 18 to 26 inches, the average annual air temperature is 38 to 44 degrees F, and the average frost-free period is less than 90 days.

This unit is 40 percent Maes very cobbly loam and 35 percent Etoe cobbly loam. The Maes soil is at the higher elevations, and the Etoe soil is at the lower elevations. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cundiyo soils near the edge of mapped areas at the higher elevations; Etoe very cobbly sandy loam, Maes cobbly loam, and Rock outcrop scattered throughout the unit; Holman soils in the lower narrow valleys; Moreno and Brycan soils in the higher narrow valleys; and Rocio, Dargol, and Fuera soils near the edge of mapped areas at the lower elevations. Included areas make up about 25 percent of the total acreage.

The Maes soil is deep and well drained. It formed in mixed material derived dominantly from sandstone and shale. Typically, the surface is covered with a mat of decomposing forest litter 2 inches thick. The surface layer is dark grayish brown very cobbly loam 1 inch thick. The subsurface layer is light yellowish brown very cobbly sandy loam 16 inches thick. The upper 7 inches of the subsoil is pale brown very cobbly loam, the next 10 inches is pale brown very cobbly sandy loam and yellow very cobbly sandy clay, and the lower part to a depth of 60 inches or more is pale brown and brownish yellow very cobbly sandy clay.

Permeability of the Maes soil is moderately slow. Available water capacity is low. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight.

The Etoe soil is deep and well drained. It formed in alluvial and colluvial material derived dominantly from sandstone and shale. Typically, the surface layer is grayish brown cobbly loam 5 inches thick. The upper 15 inches of the subsurface layer is brown very cobbly sandy loam, and the lower 12 inches is pale brown very cobbly sandy loam. The upper 11 inches of the subsoil is pale brown very cobbly sandy clay loam, the next 7 inches is very pale brown very cobbly sandy clay loam, and the lower part to a depth of 60 inches or more is light brownish gray very cobbly sandy loam.

Permeability of the Etoe soil is moderate. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for wildlife habitat, as watershed, and as woodland in the less sloping areas. Some areas are used for recreational and urban development.

This unit is suited to the production of Douglas-fir, white fir, ponderosa pine, and Englemann spruce for timber and Christmas tree production. The site index for Douglas-fir ranges from 62 to 65. On the basis of a site index of 65, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,025 or 18,300 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 45 cubic feet or 176 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on this unit are the hazard of water erosion, equipment limitations, a hazard of windthrow, and plant competition. Minimizing the risk of water erosion is essential in harvesting timber. Proper design of road drainage systems and care in the placement of culverts help to control water erosion. Spoil from excavations is subject to rill and gully erosion and to sloughing. The steepness of slope limits the kinds of equipment that can be used in forest management. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Trees commonly are subject to windthrow. Seedlings are subject to moderate mortality rates because of exposure, the density of the canopy, and the high content of rock fragments in the soil. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality.

This unit is poorly suited to recreational development. It is limited mainly by cobbles on the surface and slope.

The Maes soil is poorly suited to urban development. The main limitations are slope, cobbles on the surface and in the soil, and a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The Etoe soil is poorly suited to urban development. The main limitations are slope and cobbles on the surface and in the soil.

Mc—Manzano loam, 1 to 3 percent slopes. This deep, well drained soil is on valley floors, stream terraces, and lower side slopes and along drainageways. It formed in alluvial sediment of mixed origin. Areas are long and narrow in shape and are 10 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 5,000 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is dark brown loam 9 inches thick. The upper 15 inches of the subsoil is brown clay loam, and the lower 11 inches is pinkish gray silt loam. The substratum to a depth of 60 inches or more is light reddish brown loam.

Included in this unit are small areas of La Brier soils in depressional areas, Partri soils on the upper part of side slopes and near the edge of mapped areas, and Ustifluvents along perennial streams and drainageways. Included areas make up about 20 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Manzano soil is moderately slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. The soil is subject to rare periods of flooding.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. Some areas are used for recreational and urban development.

The potential natural plant community on this unit is mainly alkali sacaton, western wheatgrass, vine-mesquite, galleta, and blue grama. As the potential natural plant community deteriorates, western wheatgrass and vine-mesquite decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as mat muhly, ring muhly, and threeawn increase, and sleepygrass and rabbitbrush invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, vine-mesquite, and alkali sacaton.

Rangeland seeding is a suitable practice. Adapted plants suitable for seeding include improved varieties of western wheatgrass, vine-mesquite, blue grama, and alkali sacaton. This unit is suited to such rangeland management practices as mechanical treatment and mechanical brush control. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, tanks, and salt. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 3,000 pounds per acre in favorable years to 1,500 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing, water erosion, and rare periods of flooding during rainfall. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and erosion.

If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Rare periods of flooding can occur. Tillage should be kept to a minimum.

This unit is suited to hay and pasture. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

The water table in this unit is at a depth of more than 6 feet under normal conditions. Irrigation water should be applied carefully to prevent the buildup of a high water table. Seepage from irrigation ditches can also contribute to a rise in the level of the water table. Line ditches or install irrigation pipelines to reduce water loss by seepage.

This unit is poorly suited to recreational development. It is limited mainly by rare periods of flooding.

This unit is poorly suited to urban development. The main limitations are rare periods of flooding and a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

MD—Mion-Litle-Rock outcrop complex, very steep. This map unit is on hillsides and along ridges. Slope is 5 to 35 percent. Areas are long and narrow and are 40 to 320 acres in size. The native vegetation is mainly grass and scattered oneseed juniper. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 45 percent Mion very flaggy silt loam, 10 35 percent slopes; 25 percent Litle clay loam, 5 to 9 percent slopes; and 15 percent Rock outcrop. The Mio soil is on the upper part of hillsides and along ridges, t Litle soil is on lower hillsides, and Rock outcrop occurs as ledges, sheets, and short vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Colmor and Swastika soils below hills near the edge of mapped areas, Mion silty clay loam and Mion flaggy silty clay loam scattered on the upper part of hillsides througho the unit, Penrose and Penrose Variant soils near the edge of mapped areas and on small mesa tops, and Vermejo soils in swales and narrow valleys. Included areas make up about 15 percent of the total acreage.

The Mion soil is shallow and well drained. It formed fine textured material derived dominantly from shale. Typically, the surface layer is yellowish brown very fla silt loam 4 inches thick. The next layer is yellowish brown flaggy silty clay 10 inches thick. Light yellowish brown and pale brown, calcareous shale is at a depth 14 inches.

Permeability of the Mion soil is very slow. Available water capacity is very low. Effective rooting depth is 1 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Litle soil is moderately deep and well drained. I formed in residuum derived from shale. Typically, the surface layer is grayish brown clay loam 6 inches thic The subsoil is grayish brown clay 26 inches thick. Grayish brown and pale brown, calcareous shale is at depth of 32 inches.

Permeability of the Litle soil is very slow. Available water capacity is moderate. Effective rooting depth is to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop is exposed areas of shale that suppo little if any vegetation.

This unit is used mainly for livestock grazing in the less sloping open areas, for wildlife habitat, and as watershed. Some areas are used as a source of firewood and fenceposts, and other areas are used fo recreational and urban development.

The included Colmor, Swastika, and Vermejo soils receive extra runoff from adjacent higher lying areas this unit; therefore, they have the potential to be majo forage producers in this unit.

The potential natural plant community on the Mion is mainly blue grama, sideoats grama, and little blues with a scattered overstory of oneseed juniper. As the potential natural plant community deteriorates, sideoa grama and little bluestem decrease and the blue gram forms a dense, low turf. Plants that occur in the pote natural plant community in smaller amounts such as ring muhly, oneseed juniper, Gambel oak, and broom snakeweed increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, little bluestem, and blue grama.

Loss of the surface layer results in a severe decrease in productivity and in the potential of the Mion soil to produce plants suitable for grazing. The Mion soil is poorly suited to such rangeland management practices as rangeland seeding and mechanical brush management because of slope and shallow soil depth.

The potential natural plant community on the Litle soil is mainly blue grama, western wheatgrass, alkali sacaton, and galleta. As the potential natural plant community deteriorates, western wheatgrass, alkali sacaton, and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase, and oneseed juniper and Gambel oak invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, alkali sacaton, and blue grama.

The Litle soil has limited suitability for rangeland management practices such as rangeland seeding and mechanical treatment because the hazard of erosion is high in the steeper areas when the soil is tilled. Oneseed juniper and Gambel oak can be controlled by hand operations or by chemicals. Practices that facilitate rangeland management such as installation of pipelines for providing stock water, livestock watering facilities, and wells are difficult to apply on the Litle soil because of the shale at a depth of 20 to 40 inches. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines, tanks, and salt.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Mion soil ranges from 1,000 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Litle soil ranges from 1,200 pounds per acre in favorable years to 650 pounds in unfavorable years.

The Mion soil is poorly suited to recreational development. It is limited mainly by shale at a depth of 10 to 20 inches, flagstones on the surface, and slope. The Litle soil is suited to recreational development. It is limited mainly by the clayey texture of the soil.

This unit is poorly suited to urban development. The main limitations of the Mion soil are shale at a depth of 10 to 20 inches and flagstones on the surface. The main limitations of the Litle soil are shale at a depth of 20 to 40 inches and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

ME—Mion-Litle-Rock outcrop association, very steep. This map unit is on hillsides and along ridges. Slope is 5 to 35 percent. Areas are long and narrow and are 40 to 320 acres in size. The native vegetation is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 45 percent Mion flaggy silt loam, 10 to 35 percent slopes; 25 percent Litle clay loam, 5 to 9 percent slopes; and 15 percent Rock outcrop. The Mion soil is on the upper part of hillsides and along ridges, the Litle soil is on the lower part of hillsides, and Rock outcrop occurs as ledges, sheets, and short vertical escarpments.

Included in this unit are small areas of Colmor and Swastika soils at the base of hills near the edge of mapped areas, Mion silty clay loam and Mion very flaggy silt loam scattered throughout the unit on the upper part of hillsides, Penrose and Penrose Variant soils near the edge of mapped areas and on small mesa tops, and Vermejo soils in swales and narrow valleys. Included areas make up about 15 percent of the total acreage.

The Mion soil is shallow and well drained. It formed in fine textured material derived dominantly from shale. Typically, the surface layer is dark grayish brown flaggy silt loam 4 inches thick. The underlying layer is grayish brown flaggy clay 12 inches thick. Gray, calcareous shale is at a depth of 16 inches.

Permeability of the Mion soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Litle soil is moderately deep and well drained. It formed in residuum derived from shale. Typically, the surface layer is grayish brown clay loam 5 inches thick. The subsoil is grayish brown silty clay loam and silty clay 25 inches thick. The substratum is light grayish brown silty clay 6 inches thick over grayish brown, calcareous shale.

Permeability of the Litle soil is very slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

Rock outcrop is exposed areas of shale that supports little if any vegetation.

This unit is used mainly for livestock grazing in the less sloping areas, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The included Colmor, Swastika, and Vermejo soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on the Mion soil is mainly blue grama, sideoats grama, little bluestem, and galleta. As the potential natural plant community deterioriates, sideoats grama, little bluestem, and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as threeawn, sleepygrass, and broom snakeweed increase. Grazing management should be designed to increase the productivity and reproduction of sideoats grama, little bluestem, and blue grama.

Loss of the surface layer results in a severe decrease in productivity and in the potential of the Mion soil to produce plants suitable for grazing. The Mion soil is poorly suited to such rangeland management practices as rangeland seeding or mechanical treatment because of slope and shallow soil depth.

The potential natural plant community on the Litle soil is mainly blue grama, western wheatgrass, alkali sacaton, and galleta. As the potential natural plant community deteriorates, western wheatgrass, galleta, and alkali sacaton decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, broom snakeweed, and pricklypear increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, alkali sacaton, and blue grama.

The Litle soil has limited suitability for rangeland management practices such as rangeland seeding and mechanical treatment because the hazard of erosion is high. This soil has limited suitability for livestock watering ponds and other water impoundments because of the shale at a depth of 20 to 40 inches.

Slope limits access by livestock, which results in overgrazing of the less sloping areas in this unit. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, tanks, and salt. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Mion soil ranges from 1,100 pounds per acre in favorable years to 600 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Litle soil ranges from 1,200 pounds per acre in favorable years to 650 pounds in unfavorable years.

The Mion soil is poorly suited to recreational development. It is limited mainly by shale at a depth of 10 to 20 inches, flagstones on the surface, and slope. The Litle soil is suited to recreational development. It is limited mainly by the clayey texture of the soil and very slow permeablility.

This unit is poorly suited to urban development. The main limitations of the Mion soil are shale at a depth of 10 to 20 inches and flagstones on the surface. The main limitations of the Litle soil are shale at a depth of 20 to 40 inches and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

MF—Mion-Penrose Variant-Rock outcrop complex, very steep. This map unit is on hillsides and mesa tops and along ridges. Slope is 3 to 45 percent. Areas are long and narrow and are 40 to 320 acres in size. The native vegetation is mainly grass and scattered oneseed juniper. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 50 percent Mion very flaggy silt loam, 15 t 35 percent slopes; 20 percent Penrose Variant very channery loam, 3 to 45 percent slopes; and 20 percent Rock outcrop (fig. 12). The Mion soil is on the middle and lower parts of hillsides and along ridges; the Penrose Variant soil is on the upper part of hillsides, on small mesa tops, and along ridges; and Rock outcrop occurs as ledges, sheets, and short vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Colmor and Swastika soils at the base of hills near the edge of mapped areas; Litle soils at the base of hills; Mion flagg silt loam, Mion flaggy silty clay loam, and Mion silty clay loam scattered throughout on the middle and lower par of hillsides; Penrose Variant channery loam and Penros soils throughout on the upper part of hillsides; and Vermejo soils in swales and narrow valleys. Included areas make up about 10 percent of the total acreage.

The Mion soil is shallow and well drained. It formed i fine textured material derived dominantly from shale. Typically, the surface layer is dark grayish brown very flaggy silt loam 4 inches thick. The underlying layer is grayish brown flaggy silty clay 12 inches thick. Grayish brown, calcareous shale is at a depth of 16 inches.

Permeability of the Mion soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Penrose Variant soil is shallow and well drained. formed in calcareous material derived dominantly from limestone with an influence of interbedded shale. Typically, the surface layer is grayish brown very channery loam 8 inches thick. The substratum is light brownish gray very channery loam 10 inches thick ove light grayish brown and grayish brown, fractured limestone with thin strata of shale.

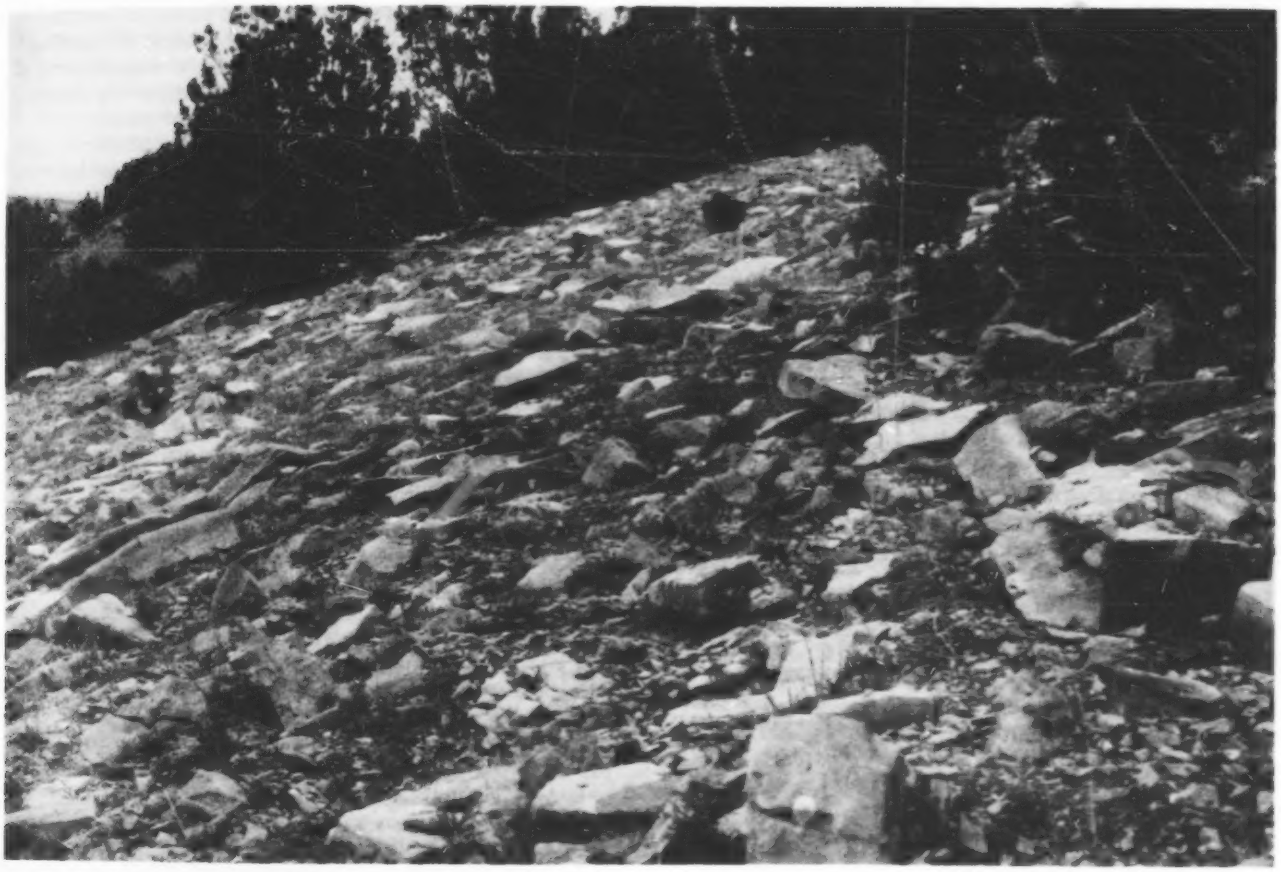

Figure 12.—Area of Mion-Penrose Variant-Rock outcrop complex, very steep.

Permeability of the Penrose Variant soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of limestone and shale that support little if any vegetation.

This unit is used mainly for livestock grazing in the less sloping open areas, for wildlife habitat, and as watershed. Some areas are used for firewood and fenceposts, and other areas are used for recreational and urban development.

The included Colmor, Litle, Swastika, and Vermejo soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on this unit is mainly blue grama, little bluestem, sideoats grama, and New Mexico feathergrass and scattered overstory of oneseed juniper. As the potential natural plant community deteriorates, sideoats grama, little bluestem, and New Mexico feathergrass decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, oneseed juniper, Gambel oak, and broom snakeweed increase.

Grazing management should be designed to increase the productivity and reproduction of sideoats grama, little bluestem, blue grama, and New Mexico feathergrass. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

This unit is poorly suited to such rangeland management practices as rangeland seeding and mechanical brush management because of slope and shallow depth to bedrock. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and watering facilities is difficult on this unit because of the shallow depth to bedrock and the areas of Rock outcrop. Oneseed juniper can be controlled by hand operations or by chemicals. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines, tanks, and salt. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,000 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is poorly suited to recreational development. The main limitations are bedrock at a depth of 10 to 20 inches, flagstones and channery fragments on the surface, and slope.

This unit is poorly suited to urban development. The main limitations are bedrock at a depth of 10 to 20 inches, flagstones and channery fragments on the surface and in the soil, and the areas of Rock outcrop.

MG—Mion-Penrose Variant-Rock outcrop association, very steep. This map unit is on hillsides and mesa tops and along ridges. Slope is 3 to 45 percent. Areas are long and narrow and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees, and the average frost-free period is 140 to 160 days.

This unit is 50 percent Mion flaggy silt loam, 15 to 35 percent slopes; 20 percent Penrose Variant channery loam, 3 to 45 percent slopes; and 20 percent Rock outcrop. The Mion soil is on the middle and lower parts of hillsides and along ridges; the Penrose Variant soil is on the upper parts of hillsides, on small mesa tops, and along ridges; and Rock outcrop occurs as ledges, sheets, and short vertical escarpments.

Included in this unit are small areas of Colmor and Swastika soils at the base of hills near the edge of mapped areas, Litle soils at the base of hills, Mion very flaggy silt loam and Mion silty clay loam scattered throughout on the middle and lower parts of hillsides, Penrose Variant very channery loam and Penrose soils scattered throughout on the upper part of hillsides, and Vermejo soils in swales and narrow valleys. Included areas make up about 10 percent of the total acreage.

The Mion soil is shallow and well drained. It formed in fine textured material derived dominantly from shale. Typically, the surface layer is grayish brown flaggy silt loam 3 inches thick. The underlying layer is light brownish gray flaggy silty clay 9 inches thick. Gray, calcareous shale is at a depth of 12 inches.

Permeability of the Mion soil is very slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Penrose Variant soil is shallow and well drained. It formed in calcareous material derived dominantly from limestone with an influence of interbedded shale. Typically, the surface layer is dark grayish brown channery loam 4 inches thick. The substratum is dark grayish brown very channery loam 7 inches thick over grayish brown, fractured limestone with thin strata of shale.

Permeability of the Penrose Variant soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of limestone and shale that support little if any vegetation.

This unit is used mainly for livestock grazing in the less sloping areas, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The included Colmor, Litle, Swastika, and Vermejo soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on the Mion soil is mainly blue grama, sideoats grama, and little bluestem. The potential natural plant community on the Penrose Variant soil is mainly sideoats grama, blue grama, little bluestem, and New Mexico feathergrass. As the potential natural plant community deteriorates, little bluestem, sideoats grama, and New Mexico feathergrass decrease and there is an increase in ring muhly, threeawn, and broom snakeweed, which normally occur in small amounts in the potential natural plant community.

Grazing management should be designed to increase the vigor, productivity, and reproduction of New Mexico feathergrass, little bluestem, and sideoats grama. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing.

Mechanical treatment is not practical because of the flaggy or channery surface layer and slope. This unit has limited suitability for rangeland management practices such as installation of fences, pipelines for providing stock water, and watering facilities because of slope and the areas of Rock outcrop. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines, tanks, and salt. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,100 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is poorly suited to recreational development. The main limitations are bedrock at a depth of 10 to 20 inches, flagstones and channery fragments on the surface, and slope.

This unit is poorly suited to urban development. The main limitations are bedrock at a depth of 10 to 20 inches, flagstones and channery fragments on the surface and in the soil, and the areas of Rock outcrop.

Mh—Moreno loam, 3 to 8 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in fine textured alluvial sediment derived dominantly from sandstone and shale. Areas are irregular in shape and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 9,000 feet. The average annual precipitaion is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 85 to 110 days.

Typically, the surface layer is brown loam 10 inches thick. The upper 5 inches of the subsoil is brown light clay loam, the next 15 inches is reddish brown clay loam, and the lower 19 inches is brown clay. The substratum to a depth of 60 inches or more is brown light clay loam.

Included in this unit are small areas of Brycan and Hesperus soils near the edge of mapped areas; Holman and Breece Variant soils and Ustifluvents in areas adjacent to drainageways; and Kinesava soils in slightly concave areas. Included areas make up about 20 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Moreno soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly mountain muhly, western wheatgrass, sideoats grama, little bluestem, and prairie junegrass. As the potential natural plant community deteriorates, the desirable forage plants such as mountain muhly, western wheatgrass, and prairie junegrass decrease and there is an increase in blue grama, ring muhly, sagewort, threeawn, and Gambel oak, which normally occur in small amounts in the potential natural plant community. Kentucky bluegrass, Gambel oak, sleepygrass, and rabbitbrush readily invade.

Grazing management should be designed to increase the vigor, productivity, and reproduction of mountain muhly, western wheatgrass, and prairie junegrass. Grazing should be delayed until the soil in this unit is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit is suited to such rangeland management practices as mechanical brush management, mechanical treatment, and rangeland seeding. Adapted plants suitable for seeding include improved varieties of mountain muhly, western wheatgrass, prairie junegrass, and sideoats grama. Gambel oak and rabbitbrush can be controlled by chemical, mechanical, or hand operations. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 1,800 pounds per acre in favorable years to 800 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water should be applied at a rate that insures optimal production without increasing deep percolation, runoff, and erosion. Line ditches or install irrigation pipelines to reduce water loss by seepage.

Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum. Terracing and contour farming reduce runoff and the risk of erosion and help to conserve moisture. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is well suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilization helps to maintain or increase yields. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

This unit is suited to Christmas tree production. The main limitation is the hazard of water erosion on the steeper slopes when the soil is tilled for planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees

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grown for Christmas trees require pruning yearly to form a dense, conical shape. Trees suited to Christmas tree production on this unit are Scotch pine and blue spruce.

This unit is well suited to recreational development. It is limited mainly by slope.

This unit is suited to urban development. It is limited mainly by a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

Mo—Moreno loam, 8 to 15 percent slopes. This deep, well drained soil is in alluvial mountain valleys. It formed in fine textured alluvial sediment derived dominantly from sandstone and shale. Areas are long and narrow and are 5 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 85 to 110 days.

Typically, the surface layer is dark grayish brown loam 11 inches thick. The subsoil is dark grayish brown and brown clay loam 28 inches thick. The substratum to a depth of 60 inches or more is brown clay loam.

Included in this unit are small areas of Brycan and Hesperus soils near the edge of mapped areas, Dargol and Vamer soils in the steeper areas near the edge of mapped areas at the higher elevations, Holman and Breece Variant soils in areas adjacent to drainageways, and Kinesava soils on the lower part of valley sides near the edge of mapped areas. Included areas make up about 25 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Moreno soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly western wheatgrass, mountain muhly, little bluestem, sideoats grama, prairie junegrass, and blue grama. As the potential natural plant community deteriorates, the desirable forage plants such as western wheatgrass, mountain muhly, and prairie junegrass decrease and there is an increase in blue grama, threeawn, ring muhly, Gambel oak, and sagewort, which normally occur in small amounts in the potential natural plant community. Sleepygrass, pinyon, and rabbitbrush readily invade.

Grazing management should be designed to increas the productivity and reproduction of western wheatgras and mountain muhly. Grazing should be delayed until t soil in this unit is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit has limited suitability for rangeland management practices such as rangeland seeding and mechanical brush management because of the high hazard of water erosion. Gambel oak and pinyon can b controlled by hand operations or by chemicals. Practic that facilitate rangeland management such as installati of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation this unit ranges from 1,600 pounds per acre in favorab years to 600 pounds in unfavorable years.

If this unit is used for nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. The unit is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy grow Terracing and contour farming reduce runoff and the r of erosion and help to conserve moisture.

This unit has limited suitability for Christmas tree production. The main limitation is the high hazard of water erosion when the soil is tilled for planting. A dependable supply of supplemental water is needed t establish seedlings during periods of low rainfall. Tree grown for Christmas trees require pruning yearly to for a dense, conical shape. Trees suited to Christmas tre production on this unit are Scotch pine and blue spruc

This unit is suited to recreational development. It is limited mainly by slope.

This unit is suited to urban development. It is limitec mainly by slope and a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

MR—Moreno-Brycan association, sloping. This r unit is in alluvial mountain valleys (fig. 13). Slope is 3 15 percent. Areas are long and narrow in shape and 25 to 250 acres in size. The native vegetation is main grass. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 18 inches, the average

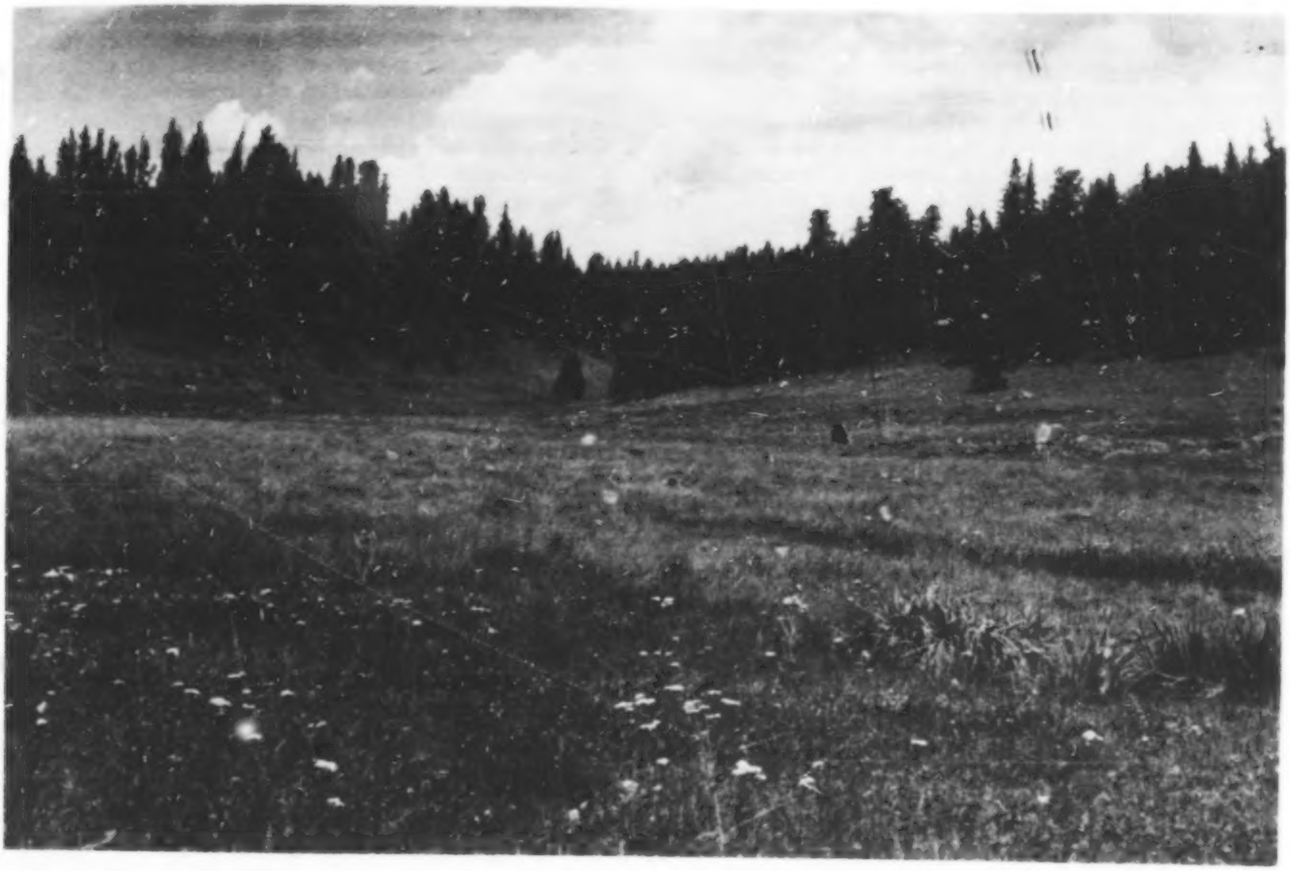

Figure 13.—Area of Moreno-Brycan association, sloping, in foreground.

annual air temperature is 42 to 45 degrees F, and the average frost-free period is 85 to 100 days.

This unit is 45 percent Moreno sandy clay loam, 8 to 15 percent slopes, and 35 percent Brycan loam, 3 to 8 percent slopes. The Moreno soil is on the upper part of valley sides and in the steeper areas, and the Brycan soil is on the lower part of valley sides and in the less sloping areas.

Included in this unit are small areas of Ceboya soils in depressional areas at the lower elevations; Dargol, Firo, and Krakon soils near the edge of mapped areas; Hesperus and Kinesava soils in slightly concave areas; Holman and Breece Variant soils and Ustifluvents in areas adjacent to drainageways; and Saladon soils in depressional areas at the higher elevations. Included areas make up about 20 percent of the total acreage.

The Moreno soil is deep and well drained. It formed in fine textured alluvial sediment derived dominantly from sandstone and shale. Typically, the upper 3 inches of the surface layer is very dark grayish brown sandy clay loam and the lower 10 inches is very dark grayish brown clay loam. The subsoil is brown clay 20 inches thick. The upper 13 inches of the substratum is brown sandy clay, and the lower part to a depth of 60 inches or more is brown gravelly sandy clay loam.

Permeability of the Moreno soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Brycan soil is deep and well drained. It formed in alluvial material derived dominantly from sandstone and shale. Typically, the upper 10 inches of the surface layer is dark grayish brown loam and the lower 6 inches is dark grayish brown loam. The upper 14 inches of the subsoil is dark brown sandy clay loam, and the lower 20 inches is brown clay loam. The substratum to a depth of 60 inches or more is brown sandy clay loam.

Permeability of the Brycan soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. A few areas have been used for Christmas tree production or have a potential for this use. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly Arizona fescue, mountain muhly, prairie junegrass, western wheatgrass, and little bluestem. As the potential natural plant community deteriorates, the desirable forage plants such as Arizona fescue, mountain muhly, and prairie junegrass decrease and there is an increase in blue grama, sagewort, ring muhly, threeawn, Gambel oak, and pinyon, which normally occur is small amounts in the potential natural plant community. Sleepygrass, Kentucky bluegrass, and ponderosa pine readily invade.

Grazing management should be designed to increase the productivity and reproduction of Arizona fescue, mountain muhly, and western wheatgrass. Grazing should be delayed until the soil in this unit is firm and the desirable forage plants have achieved sufficient growth to withstand grazing pressure.

This unit has limited suitability for rangeland management practices such as mechanical brush management and mechanical treatment because of the high hazard of water erosion. Rangeland seeding is suitable on the Brycan soil. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain muhly, and western wheatgrass. Gambel oak and pinyon can be controlled by hand operations or by chemicals. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on the Moreno soil ranges from 1,400 pounds per acre in favorable years to 600 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Brycan soil ranges from 1,800 pounds per acre in favorable years to 800 pounds in unfavorable years.

This unit has limited suitability for Christmas tree production. The main limitations are slope and the high hazard of water erosion when the soils are tilled for planting. A dependable supply of supplemental water is needed to establish seedlings during periods of low rainfall. Trees grown for Christmas trees require pruning yearly to form a dense, conical shape. Trees suited to Christmas tree production on this unit are Scotch pine and blue spruce.

The Moreno soil is suited to recreational development. It is limited mainly by slope. The Brycan soil is well suited to recreational development. It has few limitations.

The Moreno soil is suited to urban development. It is limited mainly by slope and a moderate shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The Brycan soil is well suited to urban development. It is limited mainly by slope.

NR—Nambe Variant-Rock outcrop-Rubble land complex, extremely steep. This map unit is on mountainsides and vertical mountain escarpments. Slope is 40 to 80 percent. Areas are long and narrow and are 100 to 1,000 acres in size. The native vegetation is mainly conifers. Elevation is 10,000 to 11,500 feet. The average annual precipitation is 26 to 30 inches, the average annual air temperature is 38 to 42 degrees F, and the average frost-free period is 40 to 60 days.

This unit is 35 percent Nambe Variant very stony sandy loam, 40 to 80 percent slopes, 25 percent Rock outcrop, and 25 percent Rubble land, 40 to 80 percent slopes (fig. 14). The Nambe Variant soil is throughout the unit, Rock outcrop consists of ledges, ridges, and vertical cliffs, and Rubble land is in the steeper areas throughout the unit. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cundiyo, Maes, and Etoe soils near the edge of mapped areas at the lower elevations, Holman soils on the bottom of deeply cut mountain drainageways, and Saladon soils in depressional areas. Included areas make up about 15 percent of the total acreage.

The Nambe Variant soil is deep and well drained. It formed in material derived from gneiss, schist, and other metamorphic rock. Typically, the surface is covered with a mat of decomposing forest litter 3 inches thick. The surface layer is pale brown very stony sandy loam 10 inches thick. The subsurface layer is very pale brown very stony sandy loam 11 inches thick. The subsoil is very pale brown very stony sandy loam 14 inches thick. The substratum to a depth of 60 inches or more is very pale brown very stony sandy loam.

Permeability of the Nambe Variant soil is moderately rapid. Available water capacity is low. Effective rooting

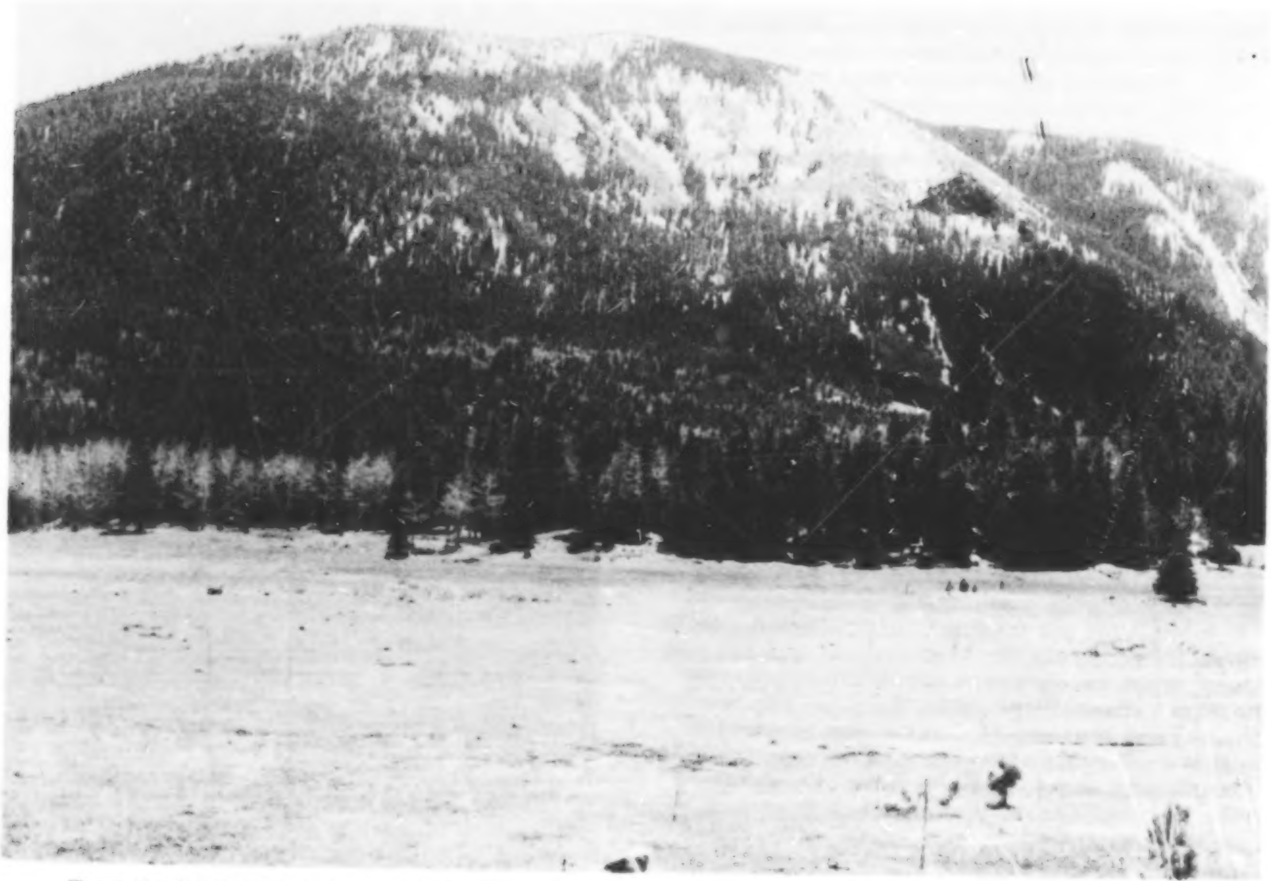

Figure 14.—View across Walker Flats, looking toward Nambe Variant-Rock outcrop-Rubble land complex, extremely steep.

depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of gneiss, schist, quartz, and mica that support little if any vegetation.

Rubble land consists mainly of stones and boulders derived from sandstone, arkosic sandstone, and mixed metamorphic rock. It supports little if any vegetation.

Most areas of this unit are used for wildlife habitat and watershed. A few areas are used for recreation and urban development. Some of the less sloping areas at the lower elevations have been logged.

The Nambe Variant soil has limited suitability for production of Douglas-fir, limber pine, and Englemann spruce for timber because of slope and the areas of Rock outcrop and Rubble land. The site index for Douglas-fir ranges from 44 to 54. On the basis of a site index of 50, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 2,500 cubic feet or 9,200 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 30 cubic feet or 90 board feet (International rule) per acre.

The main concerns in managing and harvesting timber in this unit are a hazard of water erosion, equipment limitations, seedling mortality, a hazard of windthrow, and plant competition. Minimizing the risk of water erosion is essential in harvesting timber. The steepness of slope limits the kinds of equipment that can be used in forest management. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment. The areas of Rock outcrop and Rubble land also interfere with logging. Seedlings are subject to high mortality rates because of exposure, droughtiness of the soil, and the high content of rock fragments in the soil. Trees commonly are subject to windthrow during periods when the soil is excessively wet and winds are strong.

The low available water capacity and short frost-free period influence seedling survival.

This unit is poorly suited to recreational development. It is limited mainly by slope, the areas of Rock outcrop, and stones and boulders on the surface.

This unit is poorly suited to urban development. The main limitations are slope, stones and boulders on the surface, and the areas of Rock outcrop.

Pa—Partri loam, 1 to 3 percent slopes. This deep, well drained soil is on upland side slopes. It formed in alluvium derived dominantly from limestone, sandstone, and basalt. Areas are irregular in shape and are 10 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is brown loam 3 inches thick. The upper 8 inches of the subsoil is brown clay loam, and the lower 19 inches is brown silty clay and clay loam. The substratum to a depth of 60 inches or more is pinkish white gravelly loam.

Included in this unit are small areas of Carnero soils in convex areas, La Brier and Manzano soils in swales and drainageways, Lavate Variant and Remunda soils near the edge of mapped areas in the Rainsville area, and Swastika and Torreon soils near the edge of mapped areas in the Watrous and Wagon Mound areas. Included areas make up about 15 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Partri soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland (fig. 15). The main crops are pasture, wheat, corn, and grass and legume hay. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, sideoats grama, and galleta. As the potential natural plant community deteriorates, western wheatgrass and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, buffalograss, and broom snakeweed increase, and sleepygrass and oneseed juniper invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, sideoats grama, and blue grama.

This unit is suited to such rangeland management practices as mechanical treatment, mechanical brush management, and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, sideoats grama, and blue grama. Effective livestock distribution can be accomplished by proper location of fences, watering facilities, and salt. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential of the gravelly loam substratum.

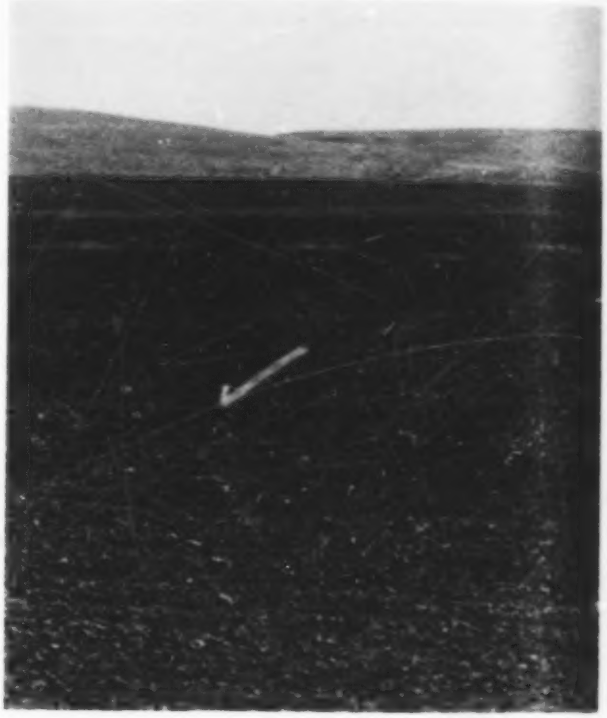

Figure 15.—Area of Partri loam, 1 to 3 percent slopes.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 500 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water needs to be applied at a rate that insures optimal production without increasing runoff and erosion.

If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum.

This unit is well suited to hay and pasture. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

This unit is well suited to recreational development. It has few limitations.

This unit is suited to urban development. The main limitations are the clayey texture of the soil, slow permeability, and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

PB—Partri loam, gently sloping. This deep, well drained soil is on upland side slopes. It formed in alluvium derived dominantly from limestone, sandstone, and basalt. Slope is 1 to 5 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is dark brown loam 2 inches thick. The upper 11 inches of the subsoil is dark brown clay loam, and the lower 21 inches is yellowish brown and brown clay loam. The substratum to a depth of 60 inches or more is pink loam.

Included in this unit are small areas of Bernal soils along ridges and the edge of drainageways, Carnero soils in convex areas, La Brier and Manzano soils in swales and drainageways, Remunda soils near the edge of mapped areas in the Rainsville area, and Swastika and Colmor soils near the edge of mapped areas in the Wagon Mound and Watrous areas. Included areas make up about 15 percent of the total acreage.

Permeability of the Partri soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, sideoats grama, and galleta. As the potential natural plant community deteriorates, western wheatgrass and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, buffalograss, and broom snakeweed increase, and sleepygrass and oneseed juniper invade. Grazing management should be designed to increase the productivity and reproduction of western wheatgrass, sideoats grama, and blue grama.

This unit is suited to such rangeland management practices as mechanical brush management and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, sideoats grama, and blue grama. Effective livestock distribution can be accomplished by proper location of fences, watering facilities, and salt. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential of the gravelly loam substratum.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 500 pounds in unfavorable years.

This unit is well suited to recreational development. It has few limitations.

This unit is suited to urban development. The main limitations are the clayey texture of the soil, slow permeability, and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

PC—Partri-Carnero-Bernal association, undulating. This map unit is on upland side slopes, on low hills, and along ridges. Slope is 1 to 8 percent. Areas are irregular in shape and are 40 to 1,000 acres in size. The native vegetation is mainly grass. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 45 percent Partri loam, 1 to 5 percent slopes; 20 percent Carnero loam, 2 to 5 percent slopes; and 20 percent Bernal loam, 3 to 8 percent slopes. The Partri soil is on the smoother side slopes and in slightly concave areas, the Carnero soil is on the upper part of side slopes and in slightly convex areas, and the Bernal soil is on low hilltops and along ridges and drainageways.

Included in this unit are small areas of Colmor and Swastika soils near the edge of mapped areas in the Watrous and Wagon Mound area, Karde soils on the leeward side of the few scattered potholes in the unit, La Brier and Manzano soils in swales and drainageways, Tricon soils on small caliche hills, Tuloso soils and Rock outcrop along the edge of slope breaks, and Vermejo soils on the bottom of the few scattered potholes in the unit that range from 2 to 25 acres in size. Included areas make up about 15 percent of the total acreage.

The Partri soil is deep and well drained. It formed in mixed alluvium derived dominantly from limestone, sandstone, and basalt. Typically, the surface layer is brown loam 3 inches thick. The upper 8 inches of the subsoil is brown clay loam, and the lower 24 inches is brown silty clay and clay. The substratum to a depth of 60 inches or more is light brown and pink gravelly loam.

Permeability of the Partri soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Carnero soil is moderately deep and well drained. It formed in residuum derived from sandstone and modified with eolian material. Typically, the surface layer is brown loam 3 inches thick. The upper 6 inches of the subsoil is brown loam, the next 7 inches is reddish brown silty clay loam, and the lower 12 inches is reddish brown silty clay. Hard sandstone is at a depth of 28 inches.

Permeability of the Carnero soil is slow. Available water capacity is low. Effective rooting depth is 25 to 35 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Bernal soil is shallow and well drained. It formed in residuum derived from sandstone and modified with eolian material. Typically, the surface layer is brown loam 4 inches thick. The upper 5 inches of the subsoil is brown loam, and the lower 10 inches is reddish brown sandy clay loam. Hard sandstone is at a depth of 19 inches.

Permeability of the Bernal soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 19 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on the Partri and Carnero soils is mainly blue grama, western wheatgrass, sideoats grama, and galleta. As the potential natural plant community deteriorates, western wheatgrass, sideoats grama, and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase, and oneseed juniper and cholla invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass and sideoats grama.

The Partri and Carnero soils are suited to such rangeland management practices as mechanical brush control and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, sideoats grama, and blue grama. Oneseed juniper and cholla can be controlled by chemical, mechanical, or hand operations. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suitable on these soils. The Carnero soil is limited for livestock watering ponds and other water impoundments because of sandstone at a depth of 25 to 35 inches.

The potential natural plant community on the Bernal soil is mainly sideoats grama, little bluestem, blue grama, and New Mexico feathergrass. As the potential natural plant community deteriorates, these plants decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as threeawn, ring muhly, broom snakeweed, and oneseed juniper increase.

Loss of the surface layer results in a severe decrease in productivity and in the potential of the Bernal soil to produce plants suitable for grazing. The Bernal soil is poorly suited to such rangeland management practices as rangeland seeding and mechanical brush control because of the shallow depth to bedrock. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and watering facilities is difficult on the Bernal soil because of the shallow depth to bedrock. Cholla and oneseed juniper can be controlled by hand operations or by chemicals.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Partri soil ranges from 1,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Carnero soil ranges from 1,300 pounds per acre in favorable years to 500 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Bernal soil ranges from 1,100 pounds per acre in favorable years to 400 pounds in unfavorable years.

The Partri soil is suited to recreational development. It has few limitations. The Carnero soil is suited to recreational development. It is limited mainly by bedrock at a depth of 25 to 35 inches. The Bernal soil is poorly suited to recreational development. it is limited mainly by shallow depth to bedrock.

The Partri soil is suited to urban development. The main limitation is the clayey texture of the soil, slow permeability, and a high shrink-swell potential during alternate periods of wetting and drying. The Carnero soil is suited to urban development. The main limitations are bedrock at a depth of 25 to 35 inches and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The Bernal soil is poorly suited to urban development. It is limited mainly by shallow depth to bedrock.

PM—Penrose-Mion-Litle association, moderately sloping. This map unit is on hillsides and mesa tops and along ridges. Slope is 3 to 15 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 30 percent Penrose channery loam, 3 to 15 percent slopes; 25 percent Mion flaggy silty clay loam, 3 to 15 percent slopes; and 25 percent Litle clay loam, 3 to 9 percent slopes. The Penrose soil is on the upper part of hillsides, on mesa tops, and along ridges; the Mion soil is on the middle and lower parts of hillsides and along ridges; and the Litle soil is along the base of hillsides.

Included in this unit are small areas of Colmor and Swastika soils at the base of hills near the edge of mapped areas, areas of Rock outcrop throughout the middle and upper parts of hillsides, Tinaja soils on terrace remnants along drainageways, and Vermejo soils in swales and narrow valleys. Also included are small areas of Penrose Variant soils, Mion flaggy silt loam, and Mion very flaggy silt loam scattered throughout the unit. ncluded areas make up about 20 percent of the total acreage.

The Penrose soil is shallow and well drained. It formed n calcareous material derived dominantly from limestone and interbedded shale. Typically, the surface layer is grayish brown channery loam 5 inches thick. The substratum is gray channery loam 14 inches thick over gray, fractured limestone with thin strata of shale.

Permeability of the Penrose soil is moderate. Available vater capacity is very low. Effective rooting depth is 10 o 20 inches. Runoff is rapid, and the hazard of water rosion is high. The hazard of soil blowing is moderate.

The Mion soil is shallow and well drained. It formed in ne textured material derived dominantly from shale. ypically, the surface layer is dark grayish brown flaggy ilty clay loam 10 inches thick. The underlying layer is rayish brown flaggy silty clay 5 inches thick. Grayish rown, calcareous shale is at a depth of 15 inches.

Permeability of the Mion soil is very slow. Available ater capacity is very low. Effective rooting depth is 10 o 20 inches. Runoff is rapid, and the hazard of water osion is high. The hazard of soil blowing is moderate.

The Litle soil is moderately deep and well drained. It rmed in residuum derived from shale. Typically, the rface layer is dark grayish brown clay loam 3 inches ick. The upper 22 inches of the subsoil is grayish own and light olive brown silty clay, and the lower 5 inches is light olive brown silty clay loam. Grayish brown and olive brown, calcareous shale is at a depth of 30 inches.

Permeability of the Litle soil is very slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The included Colmor, Swastika, and Vermejo soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on the Penrose and Mion soils is mainly blue grama, little bluestem, sideoats grama, and New Mexico feathergrass. As the potential natural plant community deteriorates, the desirable forage plants decrease and there is an increase in threeawn, ring muhly, sleepygrass, and broom snakeweed, which normally occur in small amounts in the potential natural plant community. Loss of the surface layer results in a severe decrease in productivity and in the potential of the Penrose and Mion soils to produce plants suitable for grazing. Grazing management should be designed to increase the vigor, productivity, and reproduction of little bluestem, sideoats grama, and New Mexico feathergrass.

Use of practices that facilitate rangeland management such as rangeland seeding, mechanical treatment, fencing, and installing pipelines for providing stock water is difficult on the Penrose and Mion soils because of the shallow depth to bedrock and slope.

The potential natural plant community on the Litle soil is mainly blue grama, western wheatgrass, alkali sacaton, and galleta. As the potential natural plant community deteriorates, western wheatgrass and alkali sacaton decrease and the blue grama forms a dense, low turf. Plants that occur in the plant community in smaller amounts such as ring muhly, threeawn, broom snakeweed, and pricklypear increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, alkali sacaton, and blue grama.

Slope limits access by livestock, which results in overgrazing of the less sloping areas. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, tanks, and salt. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suitable on the Litle soil. The Litle soil is limited for livestock watering ponds and other water impoundments because of the shale at a depth of 20 to 40 inches.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Penrose soil ranges from 1,100 pounds per acre in favorable years to 600 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Mion soil ranges from 1,000 pounds per acre in favorable years to 450 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Litle soil ranges from 1,200 pounds per acre in favorable years to 700 pounds in unfavorable years.

The Penrose soil is poorly suited to recreational development. It is limited mainly by limestone at a depth of 10 to 20 inches, channery fragments on the surface, and slope. The Mion soil is poorly suited to recreational development. It is limited mainly by shale at a depth of 10 to 20 inches, flagstones on the surface, and slope. The Litle soil is suited to recreational development. It is limited mainly by the clayey texture of the surface layer and very slow permeability.

This unit is poorly suited to urban development. The Penrose soil is limited mainly by limestone at a depth of 10 to 20 inches. The main limitations of the Mion soil are shale at a depth of 10 to 20 inches and flagstones on the surface and in the soil. The main limitations of the Litle soil are shale at a depth of 20 to 40 inches and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

PT—Pidineen-Tricon complex, undulating. This map unit is in areas of basalt flows on uplands. Slope is 1 to 5 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 6,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 155 days.

This unit is 40 percent Pidineen stony loam and 35 percent Tricon loam. The Pidineen soil is in the higher lying, convex areas and along crests, and the Tricon soil is in the lower lying, slightly concave areas. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Apache and Ayon soils and Rock outcrop scattered throughout the unit and near the edge of mapped areas, Capulin soils in the lower lying, concave areas near the edge of mapped areas, and Charette soils in drainageways and swales and in the lower lying areas near the edge of mapped areas. Included areas make up about 25 percent of the total acreage.

The Pidineen soil is shallow and well drained. It formed in alluvial material derived dominantly from basalt and modified with eolian material. Typically, the upper 3 inches of the surface layer is brown stony loam and the lower 4 inches is dark grayish brown loam. The subsoil brown light clay loam 6 inches thick. The substratum is brown gravelly loam 3 inches thick over indurated caliche.

Permeability of the Pidineen soil is moderate. Availab water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Tricon soil is moderately deep and well drained. formed in old alluvium and eolian sediment derived fron local sources. Typically, the surface layer is dark grayis brown loam 2 inches thick. The upper 4 inches of the subsoil is dark grayish brown clay loam, and the lower 14 inches is brown silty clay loam. The substratum is pale brown gravelly clay loam 8 inches thick over indurated caliche.

Permeability of the Tricon soil is slow. Available wate capacity is low. Effective rooting depth is 20 to 40 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The included Capulin and Charette soils receive extr runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on the Pidinee soil is mainly sideoats grama, blue grama, little blueste and New Mexico feathergrass. As the potential natural plant community deteriorates, sideoats grama, little bluestem, and New Mexico feathergrass decrease and there is an increase in ring muhly, threeawn, broom snakeweed, and oneseed juniper, which normally occu in small amounts in the potential natural plant community. Grazing management should be designed increase the vigor, productivity, and reproduction of sideoats grama and New Mexico feathergrass.

The Pidineen soil has limited suitability for rangeland management practices such as installation of fences, pipelines for providing stock water, and livestock watering facilities because of the shallow depth to the indurated caliche. This soil is poorly suited to such rangeland management practices as mechanical brush management and rangeland seeding because of the shallow depth to indurated caliche and stones on the surface.

The potential natural plant community on the Tricon soil is mainly blue grama, western wheatgrass, galleta, and sideoats grama. As the potential natural plant community deteriorates, western wheatgrass, galleta, and sideoats grama decrease and the blue grama form a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ri muhly, threeawn, and broom snakeweed increase and oneseed juniper invades. Grazing management should be designed to increase the productivity and reproduction of western wheatgrass, sideoats grama, and blue grama.

The Tricon soil is suited to such rangeland management practices as mechanical brush management and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, and sideoats grama. This soil is limited for livestock watering ponds and other water impoundments because of the indurated caliche at a depth of 20 to 40 inches.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, tanks, and salt.

The average annual production of air-dry vegetation on the Pidineen soil ranges to 1,400 pounds per acre in favorable years to 600 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Tricon soil ranges from 1,500 pounds per acre in favorable years to 700 pounds in unfavorable years.

The Pidineen soil is poorly suited to recreational development. It is limited mainly by stones on the surface and shallow depth to indurated caliche. The Tricon soil is well suited to recreational development. It has few limitations.

The Pidineen soil is poorly suited to urban development. The main limitations are stones on the surface and shallow depth to indurated caliche. The Tricon soil is suited to urban development. The main limitations are indurated caliche at a depth of 20 to 40 inches and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

RB—Raton-Barela association, hilly. This map unit is on low ridges and side slopes in areas of basalt flows. Slope is 3 to 30 percent. Areas are irregular in shape and are 80 to 640 acres in size. The native vegetation is mainly grass. Scattered conifers are in some areas. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 40 percent Raton very stony silt loam, 3 to 30 percent slopes, and 35 percent Barela silt loam, 3 to 9 percent slopes. The Raton soil is on the upper part of side slopes, along ridges, and in the steeper areas, and the Barela soil is on the lower part of side slopes and in the less sloping areas.

Included in this unit are small areas of Apache and Charette soils near the edge of mapped areas at the lower elevations, areas of Rock outcrop that are scattered throughout the unit and are near the Raton soil, Dalcan soils in small wooded areas, Spud and Burnac soils near the edge of mapped areas at the higher elevations, Saladon soils in depressional areas at the higher elevations, and Yankee soils on the lower part of side slopes and along valleys. Included areas make up about 25 percent of the total acreage.

The Raton soil is shallow and well drained. It formed in residuum derived from basalt. Typically, the surface layer is dark brown very stony silt loam 9 inches thick. The subsoil is reddish brown very stony silty clay 6 inches thick. Basalt is at a depth of 15 inches.

Permeability of the Raton soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Barela soil is deep and well drained. It formed in residuum derived from basalt. Typically, the surface layer is brown silt loam 5 inches thick. The upper 8 inches of the subsoil is brown silt loam, the next 18 inches is reddish brown silty clay loam and clay, and the lower 13 inches is reddish brown cobbly silty clay. Basalt is at a depth of 44 inches.

Permeability of the Barela soil is slow. Available water capacity is high. Effective rooting depth is 40 to 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreational and urban development.

The potential natural plant community on the Raton soil is mainly mountain muhly, sideoats grama, little bluestem, Arizona fescue, and blue grama. As the potential natural plant community deteriorates, the desirable forage plants such as mountain muhly, sideoats grama, and Arizona fescue decrease and there is an increase in blue grama, Gambel oak, and forbs, which normally occur in small amounts in the potential natural plant community. Kentucky bluegrass and sleepygrass readily invade.

The potential natural plant community on the Barela soil is mainly Arizona fescue, mountain muhly, prairie junegrass, oatgrass, and needlegrass. As the potential natural plant community deteriorates, these desirable forage plants decrease and there is an increase in ring muhly, sagewort, pingue, and Gambel oak, which normally occur in small amounts in the potential plant community. Kentucky bluegrass readily invades. Grazing management should be designed to increase the vigor, productivity, and reproduction of mountain muhly, Arizona fescue, and oatgrass.

Ponderosa pine from adjacent woodland soils readily increases on this unit. In some areas dense stands of ponderosa pine have become established. A limited wood crop can be produced in these areas if proper woodland management is used. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

The Raton soil has limited suitability for rangeland management practices such as installation of fences, pipelines for providing stock water, and watering facilities because of the shallow depth to bedrock and slope. The Barela soil is suitable for fences, pipelines for providing stock water, watering facilities, and earthen ponds.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Raton soil ranges from 1,400 pounds per acre in favorable years to 700 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Barela soil ranges from 1,600 pounds per acre in favorable years to 900 pounds in unfavorable years.

The Raton soil is poorly suited to recreational development. It is limited mainly by stones on the surface, slope, and bedrock at a depth of 10 to 20 inches. The Barela soil is well suited to recreational development. It is limited mainly by slope.

The Raton soil is poorly suited to urban development. The main limitations are stones on the surface and in the soil, slope, and bedrock at a depth of 10 to 20 inches. The Barela soil is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

RD—Raton-Dalcan association, hilly. This map unit is on low ridges and side slopes on basalt-capped mesas in areas of basalt flows. Slope is 5 to 30 percent. Areas are irregular in shape and are 80 to 640 acres in size. The native vegetation is mainly conifers with an understory of grass. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 45 percent Raton very cobbly silt loam, 5 to 30 percent slopes, and 35 percent Dalcan stony silt loam, 5 to 15 percent slopes. The Raton soil is on the upper part of side slopes and along ridges, and the Dalcan soil is on benches and the middle and lower parts of side slopes.

Included in this unit are small areas of Barela and Yankee soils on valley sides near the edge of mapped areas, areas of Rock outcrop scattered throughout the unit, Burnac and Spud soils in the steeper, north-facing areas near the edge of mapped areas at the higher elevations, Dalcan cobbly loam and Raton very stony silt loam scattered throughout the unit, and Saladon soils in depressional areas and potholes scattered throughout the unit at the higher elevations. Included areas make up about 20 percent of the total acreage.

The Raton soil is shallow and well drained. It formed in residuum derived from basalt. Typically, the surface layer is dark brown very cobbly silt loam 6 inches thick. The subsoil is brown very stony silty clay 9 inches thick. Basalt is at a depth of 15 inches.

Permeability of the Raton soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Dalcan soil is moderately deep and well drained. It formed in residuum derived from basalt. Typically, the surface layer is dark brown stony silt loam 5 inches thick. The subsoil is dark brown very stony clay 30 inches thick. Basalt is at a depth of 35 inches.

Permeability of the Dalcan soil is slow. Available water capacity is very low. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. It is also used for livestock grazing in the less sloping areas. Some areas are used for recreational and urban development.

The Raton soil is suited to the production of ponderosa pine for timber. The site index for ponderosa pine ranges from 62 to 69. On the basis of a site index of 65, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,025 cubic feet or 18,300 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 49 cubic feet or 103 board feet (International rule) per acre. Cobbles on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The Dalcan soil is suited to the production of ponderosa pine for timber. The site index for ponderosa pine ranges from 64 to 67. On the basis of a site index of 65, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,025 cubic feet or 18,300 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 50 cubic feet or 94 board feet (International rule) per acre. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment.

The main concerns for producing and harvesting timber on this unit are equipment limitations, seedling mortality, and the hazard of windthrow. Conventional methods of harvesting timber can be used. The steepness of slope in some areas limits the kinds of equipment that can be used in forest management. Rock outcrop also interferes with logging. Seedlings are subject to moderate mortality rates because of very low available water capacity and the high content of rock fragments in the soil. Among the trees that are suitable for planting are pondersoa pine and Douglas-fir. Trees are subject to windthrow because of limited rooting depth and the high content of rock fragments.

The potential understory vegetation on this unit is mainly prairie junegrass, mountain muhly, Arizona fescue, western wheatgrass, and little bluestem. As the density of the canopy cover increases or the understory plant community deteriorates, these plants decrease and there is an increase of Gambel oak, sagewort, and cinquefoil.

Grazing management should be designed to increase the vigor, productivity, and reproduction of mountain muhly and Arizona fescue. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and watering facilities is difficult on this unit because of restricted depth to bedrock, rock fragments on the surface and in the soil, and slope. Effective livestock distribution can be accomplished by proper location of salt.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush managment.

The average annual production of the understory vegetation on the Raton soil ranges from 600 pounds per acre in favorable years to 300 pounds in unfavorable years.

The average annual production of the understory vegetation on the Dalcan soil ranges from 800 pounds per acre in favorable years to 400 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by cobbles and stones on the surface, slope, and depth to bedrock.

This unit is poorly suited to urban development. The main limitations are cobbles and stones on the surface and in the soil, slope, and depth to bedrock.

RE—Raton-Rock outcrop complex, very steep. This map unit is on sides of deeply cut drainageways and craters and on the edge of basalt-capped mesas in areas of basalt flows. Slope is 15 to 50 percent. Areas are long and narrow and are 80 to 320 acres in size. The native vegetation is mainly conifers with an understory of shrubs and grasses. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the average frost-free period is 90 to 110 days.

This unit is 40 percent Raton very stony silt loam, 15 to 40 percent slopes, and 40 percent Rock outcrop. The Raton soil is on side slopes amd benches and along ridges, and Rock outcrop occurs as ledges, sheets, and vertical escarpments. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Barela and Yankee soils on toe slopes and in narrow valleys, Burnac and Spud soils on north-facing side slopes at the higher elevations, and Dalcan soils and Eutroboralfs scattered throughout the unit. Included areas make up about 20 percent of the total acreage.

The Raton soil is shallow and well drained. It formed in residuum derived from basalt. Typically, the surface layer is dark brown very stony silt loam 4 inches thick. The subsoil is dark brown very stony clay 6 inches thick. Basalt is at a depth of 10 inches.

Permeability of the Raton soil is slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

Rock outcrop is exposed areas of basalt that supports little if any vegetation.

This unit is used mainly for wildlife habitat, watershed, and woodland. Some of the less sloping areas are used for livestock grazing, and some areas are used for recreational and urban development.

The included Barela and Yankee soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

This unit has limited suitability for production of Douglas-fir, white fir, and ponderosa pine for timber because of slope, shallow soil depth, and the areas of Rock outcrop. On the basis of a site index of 73 for Douglas-fir, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,579 cubic feet or 24,760 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 52 cubic feet or 220 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on this unit are the hazard of water erosion, equipment limitations, seedling mortality, a hazard of windthrow, and plant competition. Minimizing the risk of water erosion is essential in harvesting timber. The steepness of slope limits the kinds of equipment that can be used in forest management. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging. Seedlings are subject to high mortality rates because of exposure, droughtiness, and the high content of rock fragments. Trees are subject to windthrow because of limited rooting depth. The very low available water capacity generally influences seedling survival in areas where understory plants are numerous. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and maintain water quality. Timber production on this unit is slow. Precommercial and commercial thinnings should be used to accelerate growth of desirable trees.

The potential understory on the Raton soil is mainly prairie junegrass, mountain muhly, Arizona fescue, western wheatgrass, and little bluestem. As the density of the canopy cover increases or the understory plant community deteriorates, these plants decrease and there is an increase in Gambel oak, sagewort, and cinquefoil.

This unit has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited. Mechanical treatment is not practical because of the stony surface layer and slope. Management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

This unit is poorly suited to recreational development. The main limitations are stones and cobbles on the surface, slope, and the areas of Rock outcrop.

The average annual production of air-dry vegetation on this unit ranges from 600 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is poorly suited to urban development. The main limitations are stones and cobbles on the surface and in the soil, bedrock at a depth of 10 to 20 inches, slope, and the areas of Rock outcrop.

Rf—Remunda loam, 1 to 3 percent slopes. This deep, well drained soil is on valley sides in the Rainsville area. It formed in old alluvium derived dominantly from mixed sedimentary rocks. Areas are irregular in shape and are 5 to 80 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is brown loam 10 inches thick. The upper 12 inches of the subsoil is reddish brown clay loam, and the lower 18 inches is reddish brown clay loam. The substratum to a depth of 60 inches or more is reddish brown loam.

Included in this unit are small areas of Lavate Variant soils on the upper part of side slopes and in slightly convex areas, Manzano soils in drainageways, and Remunda clay loams on the lower, concave side slopes and in depressional areas. Included areas make up about 20 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Remunda soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this unit are used as irrigated or nonirrigated cropland and wildlife habitat. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas are used for livestock grazing, and some areas have a potential for Christmas tree production. Some areas are used for recreational and urban development.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water needs to be applied at a rate that insures optimal production without increasing runoff and erosion.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Soil blowing can be reduced by planting a close-growing cover crop. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is well suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilizer is needed to insure optimal growth of grasses and legumes. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, sideoats grama, and galleta. As the potential natural plant community deteriorates, western wheatgrass, sideoats grama, and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, buffalograss, threeawn, and broom snakeweed increase, and sleepygrass invades. Grazing management should be designed to increase the vigor, productivity, and reproduction of blue grama and western wheatgrass.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, sideoats grama, and blue grama.

Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,400 pounds per acre in favorable years to 550 pounds in unfavorable years.

This unit is suited to Christmas tree production. The main limitations are the hazard of water erosion when the soil is tilled for planting and lack of a dependable water supply to establish seedlings and maintain growth. Scotch pine is suited to Christmas tree production on this unit.

This unit is well suited to recreational development. It is limited mainly by dustiness and the moderate hazard of soil blowing during extended dry periods. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is suited to urban development. The main limitations are a high shrink-swell potential during alternate periods of wetting and drying and a potential for seepage. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

Rh—Remunda clay loam, 0 to 2 percent slopes. This deep, well drained soil is on valley sides and in depressional areas in the Rainsville area. It formed in old alluvium derived from mixed sedimentary rocks. Areas are irregular in shape and are 5 to 80 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is brown clay loam 12 inches thick. The upper 8 inches of the subsoil is reddish brown clay loam, and the lower 18 inches is brown clay. The substratum to a depth of 60 inches or more is reddish brown clay loam.

Included in this unit are small areas of La Brier and Manzano soils in swales and drainageways and Lavate Variant and Remunda loams on the upper part of side slopes and in slightly convex areas. Included areas make up about 15 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Remunda soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

Most areas of this unit are used as irrigated or nonirrigated cropland and for wildlife habitat. The main crops are pasture, wheat, corn, and grass and legume hay. A few areas are used for livestock grazing, and some areas have a potential for Christmas tree production. Some areas are used for recreational and urban development.

If this unit is used for irrigated or nonirrigated crops, the main limitation is the moderate hazard of soil blowing. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of water erosion. Irrigation water should be applied at a rate that insures optimal production without increasing runoff and erosion. Because of the slow permeability of the soil, the application of water should be regulated so that water does not stand on the surface and damage the crops.

Returning all crop residue to the soil and using a cropping system that includes grasses, legumes, or grass-legume mixtures help to maintain fertility and tilth. Soil blowing can be reduced by planting a close-growing cover crop. If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable.

This unit is well suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soil from erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Fertilizer is needed to insure optimal growth of grasses and legumes. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

The potential natural plant community on this unit is mainly western wheatgrass, vine-mesquite, blue grama, alkali sacaton, and galleta. As the potential natural plant community deteriorates, western wheatgrass, vine-mesquite, alkali sacaton, and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, buffalograss, and threeawn increase, and sleepygrass and broom snakeweed invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass and blue grama.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, and vine-mesquite.

Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,550 pounds per acre in favorable years to 650 pounds in unfavorable years.

This unit has limited suitability for Christmas tree production. The main limitations are the clayey texture of the surface layer, the hazard of soil blowing when the soil is tilled for planting, and lack of a dependable water supply to establish seedlings and maintain growth. Trees suited to Christmas tree production on this unit are Scotch pine and Austrian pine.

This unit is well suited to recreational development. It has few limitations.

This unit is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

RL—Remunda-Lavate Variant association, gently sloping. This map unit is on valley sides and side slopes in the Rainsville area. Slope is 1 to 5 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 40 percent Remunda loam and 35 percent Lavate Variant loam. The Remunda soil is on the lower part of side slopes and valley sides, and the Lavate Variant soil is on the upper part of valley sides and in slightly convex areas.

Included in this unit are small areas of Bernal and Carnero soils and Rock outcrop near the edge of mapped areas and along low ridges, Manzano soils in drainageways, Partri soils near the edge of mapped areas, Remunda clay loams in level and depressional areas, and Tinaja soils near the edge of mapped areas bordered by geologic terrace remnants. Included areas make up about 25 percent of the total acreage.

The Remunda soil is deep and well drained. It formed in mixed alluvium derived dominantly from sedimentary rocks. Typically, the surface layer is brown loam 10 inches thick. The upper 5 inches of the subsoil is reddish brown loam, and the lower 37 inches is reddish brown clay loam and clay. The substratum to a depth of 60 inches or more is light reddish brown loam.

Permeability of the Remunda soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Lavate Variant soil is deep and well drained. It formed in mixed alluvial sediment derived dominantly from sedimentary rocks. Typically, the surface layer is brown loam 3 inches thick. The upper 7 inches of the subsoil is brown loam, and the lower 50 inches is reddish brown clay loam and sandy clay loam.

Permeability of the Lavate Variant soil is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. A few areas have a potential for Christmas tree production. Some areas are used for recreational and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, bottlebrush squirreltail, sideoats grama, and galleta. As the potential natural plant community deteriorates, western wheatgrass, galleta, and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, broom snakeweed, and sagewort increase, and sleepygrass invades. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, sideoats grama, and blue grama.

This unit is suited to such rangeland management practices as mechanical brush control and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, and sideoats grama. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines for providing stock water, tanks, and salt. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 700 pounds in unfavorable years.

This unit has limited suitability for Christmas tree production. The main limitations are the hazards of water erosion and soil blowing when the soils are tilled for planting and lack of a dependable water supply to establish seedlings and maintain growth. Species suited to Christmas tree production on this unit are Scotch pine and Austrian pine.

This unit is well suited to recreational development. It has few limitations.

This unit is well suited to urban development. It is limited mainly by shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

RO—Rock outcrop-Bernal complex, moderately steep. This map unit is on ridges, in drainageways, and on benches in shallow canyons. Slope is 15 to 30 percent. Areas are irregular in shape and are 40 to 400 acres in size. The native vegetation is mainly oak brush and shrubs. Grass is in open areas. Elevation is 5,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 35 percent Rock outcrop and 35 percent Bernal stony loam, 15 to 20 percent slopes. Rock outcrop occurs as ledges, sheets, and low vertical escarpments, and the Bernal soil is on benches and side slopes and along ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Carnero soils in the lower lying, convex areas, Manzano soils in swales and on valley sides, Partri soils in the lower lying, concave areas, Sombordoro and Tuloso soils scattered throughout the unit, and Haplustolls in the steeper areas near the edge of mapped areas. Included areas make up about 30 percent of the total acreage.

Rock outcrop is exposed areas of sandstone that supports little if any vegetation.

The Bernal soil is shallow and well drained. It formed in residuum derived from sandstone and modified with eolian material. Typically, the surface layer is brown stony loam 3 inches thick. The subsoil is brown gravelly clay loam 7 inches thick. Hard, red sandstone is at a depth of 10 inches.

Permeability of the Bernal soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 19 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The included Carnero, Manzano, and Partri soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on the Bernal soil is mainly sideoats grama, little bluestem, blue grama, New Mexico feathergrass, and a scattered overstory of oneseed juniper and pinyon. As the potential natural plant community deteriorates, sideoats grama, little bluestem, and New Mexico feathergrass decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as threeawn, ring muhly, and broom snakeweed increase, and oneseed juniper and cholla invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, little bluestem, and New Mexico feathergrass.

This unit has limited suitability for rangeland management practices such as installation of fences, pipelines for providing stock water, and watering facilities because of slope and shallow depth to bedrock. This unit is poorly suited to such rangeland management practices as rangeland seeding, mechanical brush control, and earthen ponds because of the areas of Rock outcrop and shallow depth to bedrock. Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Slope limits access by livestock, which results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited.

The average annual production of air-dry vegetation on this unit ranges from 1,100 pounds per acre in favorable years to 400 pounds in unfavorable years.

This unit is poorly suited to recreational and urban development. It is limited mainly by shallow depth to bedrock, areas of Rock outcrop, and slope.

SA—Sombordoro-Rock outcrop-Tuloso complex, moderately sloping. This map unit is on benches and side slopes and along ridges in shallow canyons and drainageways. Slope is 5 to 15 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly pinyon and oneseed juniper with an understory of grass. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 50 percent Sombordoro very stony sandy loam, 5 to 15 percent slopes; 25 percent Rock outcrop; and 15 percent Tuloso very stony loam, 5 to 15 percent slopes. The Sombordoro soil is on benches and side slopes, Rock outcrop occurs as ledges, sheets, and short vertical escarpments, and the Tuloso soil is on narrow benches and along ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bernal soils in areas under grass and shrubs throughout the unit, Carnero soils near the edge of mapped areas in slightly convex areas, Crews soils on caliche ridges near the edge of mapped areas, and Manzano and Partri soils in swales and in concave areas on valley sides. Included areas make up about 10 percent of the total acreage.

The Sombordoro soil is shallow and well drained. It formed in mixed material derived dominantly from sandstone and shale. Typically, the surface layer is brown very stony sandy loam 3 inches thick. The subsoil is reddish brown very stony sandy clay 11 inches thick. Hard, red sandstone is at a depth of 14 inches.

Permeability of the Sombordoro soil is slow. Available water capacity is very low. Effective rooting depth is 6 to 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of sandstone that supports little if any vegetation.

The Tuloso soil is shallow and well drained. It formed in residuum and local sediment derived dominantly from sandstone. Typically, the surface layer is brown very stony loam 2 inches thick. The subsoil is brown very stony loam 13 inches thick. The substratum is brown very stony loam 2 inches thick over hard, red sandstone.

Permeability of the Tuloso soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 19 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for firewood, fenceposts, wildlife habitat, watershed, and livestock grazing. Some areas are used for recreational and urban development.

The included Carnero, Manzano, and Partri soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on this unit is mainly pinyon and oneseed juniper with an understory of sideoats grama, little bluestem, Gambel oak, green needlegrass, plains lovegrass, pinyon ricegrass, blue grama, and sedges.

The site index for pinyon and oneseed juniper ranges from 65 to 115. The unit can produce 8 to 12 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. The main concern in managing and harvesting pinyon and juniper is the hazard of water erosion.

The potential understory vegetation decreases as the tree canopy cover increases. The highest understory production occurs in open, south-facing areas. The lowest production can be expected in north-facing areas under a dense canopy cover. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, little bluestem, plains lovegrass, pinyon ricegrass, and blue grama. As the density of the canopy cover increases or the understory plant community deteriorates, these plants decrease and there is an increase of ring muhly and broom snakeweed and an accelerated regeneration of pinyon and oneseeed juniper.

Use of mechanical treatment practices is not practical because of the shallow depth to bedrock and the areas of Rock outcrop. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and watering facilities is difficult on this unit because of the shallow depth to bedrock, areas of Rock outcrop, and the presence of trees.

The average annual production of air-dry understory vegetation on this unit ranges from 800 pounds per acre in favorable years to 400 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by shallow depth to bedrock and stones on the surface.

The Sombordoro soil is poorly suited to urban development. The main limitations are bedrock at a depth of 6 to 18 inches, stones on the surface and in the soil, and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The Tuloso soil is poorly suited to urban development. The main limitations are bedrock at a depth of 10 to 20 inches and stones on the surface and in the soil.

SB—Sombordoro-Rock outcrop-Tuloso complex, very steep. This map unit is on benches and side slopes and along ridges in deeply cut canyons and drainageways. Slope is 15 to 45 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly pinyon and oneseed juniper. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 35 percent Sombordoro very stony sandy loam, 15 to 45 percent slopes; 30 percent Rock outcrop; and 20 percent Tuloso very stony sandy loam, 15 to 35 percent slopes. The Sombordoro soil is on benches and side slopes, Rock outcrop occurs as ledges, sheets, and verticle escarpments, and the Tuloso soil is on narrow benches and along ridges. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bernal soils in areas under grass and shrubs throughout the unit, Carnero soils in slightly convex areas near the edge of areas, Crews soils near the edge of the higher lying areas, Partri soils on the lower lying, concave toe slopes adjacent to drainageways, and Manzano soils in drainageways and on valley sides. Included areas make up about 15 percent of the total acreage.

The Sombordoro soil is shallow and well drained. It formed in mixed material derived dominantly from sandstone and shale. Typically, the surface layer is brown very stony sandy loam 9 inches thick. The subsoil is reddish brown very stony light clay 9 inches thick. Hard, red sandstone is at a depth of 18 inches.

Permeability of the Sombordoro soil is slow. Available water capacity is very low. Effective rooting depth is 6 to 18 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of sandstone that supports little if any vegetation.

The Tuloso soil is shallow and well drained. It formed in residuum and local sediment derived dominantly from sandstone. Typically, the surface layer is brown very stony sandy loam 4 inches thick. The subsoil is brown very stony loam 6 inches thick. Hard, red sandstone is at a depth of 10 inches.

Permeability of the Tuloso soil is moderate. Available water capacity is very low. Effective rooting depth is 10 to 19 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as a source of firewood and fenceposts, for wildlife habitat, and as watershed. The less sloping areas are used for livestock grazing. Some areas are used for recreational and urban development.

The included Carnero, Manzano, and Partri soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on this unit is mainly pinyon and oneseed juniper with an understory of sideoats grama, little bluestem, Gambel oak, plains lovegrass, pinyon ricegrass, blue grama, and sedges.

The site index for pinyon and oneseed juniper ranges from 65 to 115. The unit can produce 8 to 12 cords of wood per acre in a stand of trees that average 5 inches in diameter at a height of 1 foot. Woodland management for firewood and fenceposts is limited because of slope and the areas of Rock outcrop.

The understory vegetation decreases as the tree canopy cover increases. The highest understory production occurs in open, south-facing areas. The lowest production can be expected in north-facing areas under a dense canopy cover. Maximum understory production can be obtained by selectively thinning and by reducing the density of the canopy to a desirable level.

Grazing management should be designed to increase the productivity and reproduction of sideoats grama, little bluestem, plains lovegrass, pinyon ricegrass, and blue grama. As the density of the canopy cover increases or the potential understory plant community deteriorates, these plants decrease and there is an increase in ring muhly, broom snakeweed, and Gambel oak and an accelerated regeneration of pinyon and oneseed juniper.

This unit has limited suitability for livestock grazing or rangeland management practices because of the areas of Rock outcrop and slope.

The average annual production of air-dry understory vegetation on this unit ranges from 700 pounds per acre in favorable years to 300 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by shallow depth to bedrock, stones on the surface, and slope.

This unit is poorly suited to urban development. The main limitations of the Sombordoro soil are bedrock at a depth of 6 to 18 inches, stones on the surface and in the soil, slope, and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The main limitations of the Tuloso soil are bedrock at a depth of 10 to 20 inches, stones on the surface and in the soil, and slope.

SM—Spud-Burnac association, very steep. This map unit is on the sides of basalt-capped mountains. Slope is 25 to 50 percent. Areas are irregular in shape and are 150 to 640 acres in size. The native vegetation is mainly conifers. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 18 to 20 inches, the average annual air temperature is 40 to 45 degrees F, and the average frost-free period is 80 to 110 days.

This unit is 50 percent Spud very stony loam, 25 to 50 percent slopes, and 30 percent Burnac stony loam, 25 to 40 percent slopes. The Spud soil is on the lower part of mountainsides and in the steeper areas, and the Burnac soil is on the lower part of mountainsides and in the less sloping areas.

Included in this unit are small areas of Dargol soils near the edge of mapped areas at the lower elevations; Hillery soils in the smoother grassed areas near the edge of mapped areas at the higher elevations; Raton, Dalcan, and Barela soils near the edge of mapped areas; and Rock outcrop scattered throughout the unit. Included areas make up about 20 percent of the total acreage.

The Spud soil is deep and well drained. It formed in fine textured alluvial, colluvial, and residual material derived dominantly from basalt and modified with sandstone and shale. Typically, the surface is covered with a mat of decomposing forest litter 2 inches thick. The surface layer is dark gray very stony loam 5 inches thick. The upper 6 inches of the subsurface layer is brown very stony loam, and the lower 11 inches is brown very stony loam. The upper 4 inches of the subsoil is brown clay loam, the next 23 inches is reddish brown clay, the next 19 inches is reddish brown stony clay loam, and the lower part to a depth of 78 inches is reddish brown very stony sandy clay loam.

Permeability of the Spud soil is very slow. Available water capacity is high. Effective rooting depth is 78 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

The Burnac soil is deep and well drained. It formed in residuum derived from basalt. Typically, the surface is covered with a mat of decomposing forest litter 2 inches thick. The surface layer is dark grayish brown stony loam 7 inches thick. The subsurface layer is brown stony loam 8 inches thick. The upper 8 inches of the subsoil is brown silty clay, the next 7 inches is reddish brown clay, and the lower 7 inches is reddish brown silty clay. The substratum is reddish brown very stony silty clay 23 inches thick. Basalt is at a depth of 60 inches or more.

Permeability of the Burnac soil is very slow. Available water capacity is moderate. Effective rooting depth is 40 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly as woodland, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The Spud soil is suited to the production of Douglas-fir and ponderosa pine for timber and to the production of white fir for timber and Christmas trees. The site index for Douglas-fir ranges from 65 to 70. On the basis of a site index of 70, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,480 cubic feet or 22,000 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 51 cubic feet or 160 board feet (International rule) per acre.

The Burnac soil is suited to the production of Douglas-fir and ponderosa pine for timber and to the production of white fir for timber and Christmas trees. The site index for Douglas-fir ranges from 64 to 68. On the basis of a site index of 68, the potential production per acre of merchantable timber from an even-aged, fully stocked stand of trees 100 years old is 4,200 cubic feet or 21,500 board feet (International rule, 1/8-inch kerf). At the culmination of the mean annual increment (CMAI), production is 49 cubic feet or 150 board feet (International rule) per acre.

The main concerns for producing and harvesting timber on this unit are seedling mortality, equipment limitations, a hazard of windthrow, and the hazard of erosion. Seedlings are subject to a moderate mortality rate because of exposure, a dense canopy, and stoniness. If the site is not adequately prepared, competition from undesirable plants can prevent or retard natural or artificial reestablishment of trees. Brushy plants such as oak and prickly rose may limit natural regeneration of Douglas-fir. Stones on the surface can interfere with felling, yarding, and other operations involving the use of equipment. Rock outcrop also interferes with logging. Conventional methods of harvesting timber are difficult to use because of slope. The steepness of slope limits the kinds of equipment that can be used in forest management. Trees growing on spoil from excavations are subject to windthrow during periods when the soil is excessively wet and winds are strong. Minimizing the risk of erosion is essential in harvesting timber. Proper design of road drainage systems and care in the placement of culverts help to control erosion. An undisturbed buffer or filter strip should be left along all watercourses to reduce sedimentation and protect the quality of the water.

The soils in this unit are poorly suited to recreational development. They are limited mainly by slope, stones on the surface, and very slow permeability.

This unit is poorly suited to urban development. The main limitations are stones on the surface and in the soil, slope, and a high shrink-swell potential during alternate periods of wetting and drying. The Burnac soil is also limited by bedrock at a depth of 40 to 60 inches or more. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

SW—Swastika silt loam, gently sloping. This deep, well drained soil is on side slopes. It formed in fine textured residuum derived from shale. Slope is 1 to 5 percent. Areas are irregular in shape and are 40 to 1,000 acres in size. The native vegetation is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is dark grayish brown silt loam 5 inches thick. The upper 5 inches of the subsoil is dark grayish brown clay loam, and the lower 23 inches is brown and very pale brown silty clay and silty clay loam. The substratum to a depth of 60 inches or more is light yellowish brown silt loam.

Included in this unit are small areas of Colmor soils near the edge of mapped areas and in slightly convex areas, Karde soils on the leeward side of the few potholes scattered throughout the unit, La Brier and Vermejo soils in swales and potholes, Litle soils in the steeper, convex areas near the edge of mapped areas, and Partri soils near the edge of mapped areas. Included areas make up about 15 percent of the total acreage.

Permeability of the Swastika soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, galleta, and sideoats grama. As the potential natural plant community deteriorates, western wheatgrass and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of blue grama and western wheatgrass.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, and sideoats grama. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit.

The average annual production of air-dry vegetation on this unit ranges from 1,500 pounds per acre in favorable years to 600 pounds in unfavorable years.

This unit is suited to recreational development. It is limited mainly by dustiness during dry periods. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover.

This unit is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

Sx—Swastika silty clay loam, 0 to 3 percent slopes. This deep, well drained soil is on upland side slopes. It formed in fine textured residuum derived from shale. Areas are irregular in shape and are 10 to 100 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is dark grayish brown silty clay loam 8 inches thick. The subsoil is grayish brown and dark yellowish brown silty clay 17 inches thick. The substratum to a depth of 60 inches or more is light yellowish brown silt loam.

Included in this unit are small areas of Colmor soils on the upper part of side slopes and near the edge of mapped areas, La Brier and Vermejo soils in swales, Litle soils in the steeper, convex areas near the edge of mapped areas, Partri soils near the edge of mapped areas, and Ustifluvents in drainageways. Included areas make up about 20 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Swastika soil is slow. Available water capacity is very high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, galleta, and sideoats grama. As the potential natural plant community deteriorates, western wheatgrass and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, threeawn, and broom snakeweed increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of blue grama and western wheatgrass.

This unit is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, and sideoats grama. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit.

The average annual production of air-dry vegetation on this unit ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the moderate hazards of soil blowing and water erosion. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Irrigation water should be applied at a rate that insures optimal production without increasing runoff and erosion.

If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Tillage should be kept to a minimum.

This unit is well suited to hay and pasture. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage.

This unit is suited to recreational development. It has few limitations.

This unit is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

TA—Tinaja gravelly loam, moderately steep. This deep, well drained soil is on terrace remnants. It formed in medium to coarse textured gravelly alluvial material derived from various kinds of rock. Slope is 5 to 30 percent. Areas are oval or rounded in shape and are 25 to 200 acres in size. The native vegetation is mainly grass. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is brown gravelly loam 3 inches thick. The upper 7 inches of the subsoil is brown gravelly loam and the lower 15 inches is pinkish gray very gravelly loam. The upper 14 inches of the substratum is pinkish white extremely gravelly loamy sand, the next 9 inches is light brown loamy coarse sand, and the lower part to a depth of 68 inches or more is light brown extremely gravelly loamy sand.

Included in this unit are small areas of Bernal, Carnero, Mion, and Penrose soils near the upper edge of mapped areas, Manzano soils in swales and drainageways, Partri and Colmor soils in the lower lying, concave areas near the edge of mapped areas, and Remunda and Lavate Variant soils near the edge of mapped areas in the Rainsville area. Included areas make up about 20 percent of the total acreage.

Permeability of the Tinaja soil is moderate. Available water capacity is very low. Effective rooting depth is 68 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing and wildlife habitat and as a source of sand and gravel. Some areas are used for recreation and urban development.

The included Colmor, Lavate Variant, Manzano, Partri, and Remunda soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on this unit is mainly sideoats grama, blue grama, little bluestem, hairy grama, and New Mexico feathergrass. As the potential natural plant community deteriorates, sideoats grama, little bluestem, and New Mexico feathergrass decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, wolftail, threeawn, broom snakeweed, fringed sagewort, and oneseed juniper increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, New Mexico feathergrass, and little bluestem.

Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and watering facilities is difficult on this unit because of coarse fragments on the surface and throughout the soil. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Oneseed juniper can be controlled by hand operations or by chemicals. Effective livestock distribution can be accomplished by proper placement of fences, wells, pipelines, tanks, and salt. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry vegetation on this unit ranges from 1,150 pounds per acre in favorable years to 450 pounds in unfavorable years.

This unit is poorly suited to recreational development. It is limited mainly by pebbles on the surface and slope.

This unit is poorly suited to urban development. The main limitations are a high seepage potential, coarse fragments on the surface and in the soil, and slope.

This unit is suitable as a source of sand and gravel. The material commonly is stratified, and separation generally is required.

TT—Torreon-Thunderbird association, gently sloping. This map unit is on low hills and side slopes on the Maxson Crater basalt flow. Slope is 1 to 8 percent. Areas are irregular in shape and are 40 to 640 acres in size. The native vegetation is mainly grass. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 45 percent Torreon loam, 1 to 5 percent slopes, and 40 percent Thunderbird cobbly loam, 2 to 8 percent slopes. The Torreon soil is on the lower part of side slopes, and the Thunderbird soil is on the upper part of side slopes and on low hills.

Included in this unit are small areas of Apache and Pidineen soils along ridges and on low hilltops, Ayon soils on side slopes throughout the unit, La Brier soils in swales and on the bottoms of the few potholes in the unit, and Partri and Swastika soils near the edge of mapped areas. Included areas make up about 15 percent of the total acreage.

The Torreon soil is deep and well drained. It formed in alluvial material derived dominantly from basalt and modified with eolian material. Typically, the surface layer is dark grayish brown loam 2 inches thick. The upper 10 inches of the subsoil is dark grayish brown light clay loam, and the lower 48 inches is brown and light brown silty clay and clay loam.

Permeability of the Torreon soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is moderate.

The Thunderbird soil is moderately deep and well drained. It formed in fine textured material derived dominantly from basalt and modified with eolian material. Typically, the surface layer is brown cobbly loam 2 inches thick. The upper 6 inches of the subsoil is brown silty clay loam, and the lower 22 inches is brown clay and silty clay. The substratum is light brown cobbly clay loam 6 inches thick over basalt. A thin, discontinuous calcium carbonate accumulation is on the surface of the basalt.

Permeability of the Thunderbird soil is slow. Available water capacity is moderate. Effective rooting depth is 20 to 40 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly blue grama, western wheatgrass, sideoats grama, and galleta. As the potential natural plant community deterioriates, western wheatgrass, sideoats grama, and galleta decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, broom snakeweed, threeawn, and sagewort increase. Grazing management should be designed to increase the productivity and reproduction of western wheatgrass, blue grama, and sideoats grama.

The Torreon soil is suited to such rangeland management practices as mechanical treatment and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, blue grama, and sideoats grama. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. The Thunderbird soil is limited for livestock watering ponds and other water impoundments because of bedrock at a depth of 20 to 40 inches.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on this unit ranges from 1,600 pounds per acre in favorable years to 700 pounds in unfavorable years.

The Torreon soil is well suited to recreational development. It is limited mainly by dustiness during dry periods. Areas used for recreation can be protected from soil blowing and dust by maintaining plant cover. The Thunderbird soil is poorly suited to recreational development. It is limited mainly by cobbles on the surface.

This unit is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying and by bedrock at a depth of 20 to 40 inches in the Thunderbird soil. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shirnk-swell potential.

US—Ustifluvents, frequently flooded. These soils are extremely variable in their characteristics. They are moderately deep to deep and are well drained. They are on nearly level flood plains along major drainageways. The soils formed in alluvial material derived from various kinds of rock. Slope is 0 to 2 percent. Areas are long and narrow and are 10 to 100 acres in size. The native vegetation is mainly grass and water tolerant sedges and shrubs. Elevation is 5,500 to 8,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 44 to 52 degrees F, and the average frost-free period is 90 to 160 days.

No single profile of these soils is typical, but in one commonly observed in the survey area the upper 4 inches of the surface layer is yellowish brown loam and the lower 8 inches is brown sandy loam. The next layer is brown loam 14 inches thick. The next layer is a buried surface layer of dark grayish brown clay loam 9 inches thick. The substratum to a depth of 60 inches or more is brown loam.

Included in this unit are small areas of Brycan, Ceboya, Hesperus, Holman, Kinesava, and Moreno soils near the edge of mapped areas in the western part of the survey area and La Brier, Manzano, and Vermejo soils near the edge of mapped areas in the central and eastern parts of the survey area. Included areas make up about 25 percent of the total acreage.

Permeability of the Ustifluvents is moderately rapid to very slow. Available water capacity is low to high. Effective rooting depth is 30 to 60 inches or more. Runoff is slow, and the hazard of water erosion is high. The hazard of soil blowing is moderate. Frequent periods of flooding can occur during rainfall and runoff.

Most areas of this unit are used for livestock grazing. A few areas are used as cropland. Some areas are used for recreation and urban development.

Because of the frequent periods of flooding and extreme variability of the soils, this unit is poorly suited to most uses except occasional grazing by livestock.

At the lower elevations, the potential natural plant community on this unit is mainly alkali sacaton, western wheatgrass, vine-mesquite, galleta, sideoats grama, Canada wildrye, blue grama, and Apacheplume. As the potential natural plant community deteriorates, these plants decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, mat muhly, threeawn, inland saltgrass, and broom snakeweed increase. Sleepygrass invades. Grazing management should be designed to increase the productivity and reproduction of western wheatgrass, vine-mesquite, and sideoats grama.

At the higher elevations, the potential natural plant community is mainly tufted hairgrass, mountain brome, western wheatgrass, sedges, and red fescue. As the potential natural plant community deteriorates, the desirable forage plants such as tufted hairgrass, mountain brome, sedges, and red fescue decrease and there is an increase in Baltic rush, iris, western yarrow, willows, and shrubby cinquefoil, which normally occur in small amounts in the potential natural plant community. Dandelion and introduced forage grasses such as timothy, redtop, and Kentucky bluegrass readily invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of tufted hairgrass and mountain brome. Grazing should be delayed until the soils are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

Maximum forage production can be achieved by concentrating livestock in small pastures and rotating grazing during the summer to allow forage plants to maintain high vigor.

This unit has limited suitability for rangeland management practices such as rangeland seeding and mechanical brush control because of the frequent periods of flooding and common gullies. This unit is limited for livestock watering ponds and other water impoundments because of the frequent periods of flooding and seepage potential. Management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry vegetation on this unit ranges from 3,000 pounds per acre in favorable years to 1,200 pounds in unfavorable years at the lower elevations and from 3,500 pounds per acre in favorable years to 1,800 pounds in unfavorable years at the higher elevations.

This unit is poorly suited to recreational development. It is limited mainly by the frequent periods of flooding.

This unit is poorly suited to urban development. The main limitations are the frequent periods of flooding and extreme variability of the soils.

VA—Vamer-Rock outcrop-Eutroboralfs complex, hilly. This map unit is on mountainsides, foothills, and mesas. Slope is 8 to 25 percent. Areas are irregular in shape and are 50 to 640 acres in size. The native vegetation is mainly oak brush, shrubs, and grass and scattered overstory of pinyon, juniper, and ponderosa pine. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 22 inches, the average annual air temperature is 40 to 44 degrees F, and the average frost-free period is 85 to 110 days.

This unit is 35 percent Vamer stony loam, 8 to 25 percent slopes; 20 percent Rock outcrop; and 20 percent Eutroboralfs loam, 8 to 25 percent slopes. The Vamer soil is on mesas, benches, and upper side slopes and along ridges; Rock outcrop occurs as ledges, sheets, and short vertical escarpments; and the Eutroboralfs are scattered throughout the unit. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bernal and Sombordoro soils near the edge of mapped areas at the lower elevations; Brycan, Hesperus, Kinesava, and Moreno soils in narrow valleys; Dargol soils and Eutroboralfs scattered throughout the unit; Firo soils and metamorphic rock near the edge of mapped areas; Holman and Breece Variant soils in areas adjacent to drainageways; Krakon soils near the edge of mapped areas in the Chacon area; and Maes, Etoe, and Fuera soils near the edge of mapped areas at the higher elevations. Included areas make up about 25 percent of the total acreage.

The Vamer soil is shallow and well drained. It formed in old sediment derived dominantly from sandstone and shale. Typically, the surface layer is dark grayish brown stony loam 4 inches thick. The subsoil is yellowish brown clay 10 inches thick. Hard, brown sandstone is at a depth of 14 inches.

Permeability of the Vamer soil is slow. Available water capacity is very low. Effective rooting depth is 7 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

Rock outcrop is exposed areas of sandstone and shale that support little if any vegetation.

The Eutroboralfs are extremely variable in their characteristics. They are shallow to deep and are well drained. They formed in mixed material derived dominantly from sandstone and shale. Typically, the surface layer is brown loam 15 inches thick. The upper 15 inches of the subsoil is reddish brown clay loam, and the lower part to a depth of 60 inches or more is reddish brown very cobbly sandy clay.

Permeability of the Eutroboralfs is moderate to very slow. Available water capacity is very low to high. Effective rooting depth is 19 to 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight.

This unit is used mainly for wildlife habitat and watershed. It is also used for livestock grazing in the less sloping areas. Some areas are used for recreation and urban development.

The included Brycan, Hesperus, Kinesava, and Moreno soils receive extra runoff from adjacent higher lying areas of this unit; therefore, they have the potential to be major forage producers in this unit.

The potential natural plant community on the Vamer soil is mainly Arizona fescue, mountain muhly, prairie junegrass, oatgrass, needlegrass, Gambel oak, and scattered pinyon. As the potential natural plant community deteriorates, Arizona fescue, mountain muhly, prairie junegrass, and oatgrass decrease and there is an increase in Gambel oak, pinyon, Rocky Mountain juniper, blue grama, and sagewort, which normally occur in small amounts in the potential natural plant community.

The potential natural plant community on the Eutroboralfs is mainly Gambel oak, pinyon, mountain muhly, Arizona fescue, Rocky Mountain juniper, mountainmahogany, and prairie junegrass. As the potential natural plant community deteriorates, mountain muhly, Arizona fescue, and prairie junegrass decrease and there is an increase in Gambel oak, pinyon, Rocky Mountain juniper, and blue grama, which normally occur in small amounts in the potential natural plant community.

Grazing management should be designed to increase the vigor, productivity, and reproduction of Arizona fescue, mountain muhly, and prairie junegrass on this unit. Slope limits access by livestock, which results in overgrazing of the less sloping areas. Trails or walkways can be constructed in places to encourage livestock to graze in areas where access is limited.

Use of mechanical treatment practices is not practical because of the shallow depth to bedrock, slope, and the areas of Rock outcrop. Use of practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, and tanks is difficult on this unit because of the shallow depth to bedrock and the areas of Rock outcrop. Gambel oak, pinyon, and Rocky Mountain juniper can be controlled by hand operations. Other management practices suitable for use on this unit are proper grazing use, deferred grazing, and rotation grazing.

The average annual production of air-dry vegetation on the Vamer soil ranges from 1,400 pounds per acre in favorable years to 700 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Eutroboralfs ranges from 1,000 pounds per acre in favorable years to 500 pounds in unfavorable years.

This unit is poorly suited to recreational development. The main limitations are shallow depth to bedrock, slope, stones on the surface, and the areas of Rock outcrop.

This unit is poorly suited to urban development. The main limitations are shallow depth to bedrock, slope, stones on the surface, and the areas of Rock outcrop.

Ve—Vermejo silty clay loam, 0 to 3 percent slopes. This deep, moderately well drained soil is in wide, flat drainageways, on valley floors, and on bottoms of old dry lakebeds. It formed in fine textured alluvial deposits derived dominantly from shale. Areas are irregular in shape and are 10 to 640 acres in size. The vegetation in areas not cultivated is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

Typically, the surface layer is grayish brown silty clay loam 2 inches thick. The next layer is grayish brown clay 8 inches thick. The substratum to a depth of 60 inches or more is grayish brown clay.

Included in this unit are small areas of Colmor soils in slightly elevated, convex areas, Karde soils on the leeward side of mapped areas, La Brier soils in swales, Litle soils and shale Rock outcrop in the steeper areas near the edge of mapped areas and along eroded drainageways, Swastika soils near the edge of mapped areas, and Ustifluvents along drainageways. Included areas make up about 15 percent of the total acreage. Individual included areas generally range from less than 1 acre to 3 acres in size.

Permeability of the Vermejo soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. Salinity is slight to moderate. Rare periods of flooding can occur during rainfall and runoff.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and irrigated or nonirrigated cropland. The main crops are pasture, wheat, corn, and grass and legume hay. Some areas are used for recreation and urban development.

The potential natural plant community on this unit is mainly alkali sacaton, western wheatgrass, vine-mesquite, blue grama, galleta, and sideoats grama. As the potential natural plant community deteriorates, western wheatgrass, vine-mesquite, and sideoats grama decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as mat muhly, ring muhly, threeawn, and broom snakeweed increase. Sleepygrass and rabbitbrush invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, vine-mesquite, and alkali sacaton.

This unit is suited to such rangeland management practices as mechanical brush control and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, vine-mesquite, blue grama, and alkali sacaton. The salinity of the soil limits the choice of seeding varieties. Salt tolerant grasses should be selected. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suited to this unit. Other suitable practices are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management. Rare periods of flooding limit the time of grazing on the unit. Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on this unit ranges from 4,000 pounds per acre in favorable years to 1,500 pounds in unfavorable years.

If this unit is used for irrigated or nonirrigated crops, the main limitations are the hazard of soil blowing, rare periods of flooding during periods of rainfall, and salinity, which limits the choice of crops. For maximum production of most crops, irrigation is required in spring, summer, and fall. Furrow, border, corrugation, and sprinkler irrigation systems are suited to this unit. Sprinkler irrigation is the most suitable method of applying water. Use of this method permits the even, controlled application of water, reduces runoff, and minimizes the risk of erosion. Because of the silty clay loam texture of the surface layer and the very slow permeability, the application of water should be regulated so that water does not stand on the surface and damage the crops.

If irrigation is not used, crops that are tolerant of drought are best suited. Because precipitation is not sufficient for annual cropping, a cropping system that includes small grain and summer fallow is most suitable. Maintaining crop residue on or near the surface reduces runoff, reduces soil blowing, and helps to maintain good soil tilth and organic matter content. Rare periods of flooding can occur during periods of rainfall and runoff. Tillage should be kept to a minimum.

This unit is suited to hay and pasture. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Proper grazing practices, weed control, and fertilizer are needed to insure maximum quality of forage. Most crops, except legumes, respond to nitrogen; legumes respond to phosphorus.

The water table in this unit is at a depth of more than 6 feet under normal conditions. Irrigation water should be applied carefully to prevent the buildup of a high water table. Seepage from irrigation ditches can also contribute to a high water table. Line ditches or install irrigation pipelines to reduce water loss by seepage.

This unit is poorly suited to recreational development. It is limited mainly by salinity and rare periods of flooding during rainfall and runoff.

This unit is poorly suited to urban development. The main limitations are the rare periods of flooding during periods of rainfall and runoff and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

VK—Vermejo-Karde association, gently sloping. This map unit is on the bottoms and leeward side slopes of dry and intermittent lakes and potholes. Slope is 0 to 8 percent. Areas are rounded in shape and are 40 to 320 acres in size. The native vegetation is mainly grass. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the average frost-free period is 140 to 160 days.

This unit is 40 percent Vermejo silty clay loam, 0 to 3 percent slopes, and 35 percent Karde fine sandy loam, 2 to 8 percent slopes. The Vermejo soil is on the bottom of dry lakes and potholes, and the Karde soil is on the leeward side slopes.

Included in this unit are small areas of Colmor, Partri, and Swastika soils near the edge of mapped areas and Litle soils and shale Rock outcrop in the steeper areas near the edge of mapped areas and along eroded drainageways. Included areas make up about 25 percent of the total acreage.

The Vermejo soil is deep and moderately well drained. It formed in fine textured alluvial deposits derived dominantly from shale. Typically, the surface layer is grayish brown silty clay loam 2 inches thick. The substratum to a depth of 60 inches or more is light brownish gray clay.

Permeability of the Vermejo soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is high. Salinity is slight to moderate. Rare periods of flooding can occur during rainfall and runoff.

The Karde soil is deep and well drained. It formed in eolian sediment derived dominantly from the beds of dry or intermittent lakes. Typically, the surface layer is brown fine sandy loam 3 inches thick. The next layer is brown loam 10 inches thick. The upper 11 inches of the substratum is brownish gray silt loam, and the lower part to a depth of 60 inches or more is very pale brown silt loam.

Permeability of the Karde soil is moderate. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. Some areas are used for recreation and urban development.

The potential natural plant community on the Vermejo soil is mainly alkali sacaton, western wheatgrass, vine-mesquite, and blue grama. As the potential natural plant community deteriorates, western wheatgrass and vine-mesquite decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as buffalograss, mat muhly, and inland saltgrass increase and sleepygrass and rabbitbrush invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of western wheatgrass, vine-mesquite, and alkali sacaton.

The Vermejo soil is suited to such rangeland management practices as mechanical brush management and rangeland seeding. Adapted plants suitable for seeding include improved varieties of western wheatgrass, vine-mesquite, and blue grama. The salinity limits the choice of seeding varieties. Salt tolerant grasses should be selected. Rare periods of flooding limit the time of grazing on this soil.

The potential natural plant community on the Karde soil is mainly blue grama, sideoats grama, western wheatgrass, and winterfat. As the potential natural plant community deteriorates, sideoats grama, western wheatgrass, and winterfat decrease and the blue grama forms a dense, low turf. Plants that occur in the potential natural plant community in smaller amounts such as ring muhly, mat muhly, threeawn, and broom snakeweed increase. Grazing management should be designed to increase the vigor, productivity, and reproduction of sideoats grama, blue grama, western wheatgrass, and winterfat.

The Karde soil has limited suitability for rangeland management practices such as rangeland seeding and mechanical brush management because of the hazard of soil blowing. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suitable on this soil.

Management practices suitable for use on this unit are proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

The average annual production of air-dry vegetation on the Vermejo soil ranges from 2,800 pounds per acre in favorable years to 1,200 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Karde soil ranges from 1,500 pounds per acre in favorable years to 800 pounds in unfavorable years.

The Vermejo soil is poorly suited to recreational development. It is limited mainly by salinity and rare periods of flooding during periods of rainfall and runoff. The Karde soil is suited to recreational development. It is limited mainly by salinity.

The Vermejo soil is poorly suited to urban development. The main limitations are the rare periods of flooding during periods of rainfall and runoff and a high shrink-swell potential during alternate periods of wetting and drying. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential. The Karde soil is well suited to urban development. It is limited mainly by potential seepage.

YS—Yankee-Saladon association, gently sloping. This map unit is on valley sides in areas of basalt flows. Slope is 0 to 9 percent. Areas are long and narrow and are 40 to 150 acres in size. The native vegetation is mainly grass and water tolerant sedges. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 41 to 44 degrees F, and the average frost-free period is 85 to 105 days.

This unit is 60 percent Yankee loam, 1 to 9 percent slopes, and 20 percent Saladon mucky silty clay loam, 0 to 2 percent slopes. The Yankee soil is on valley sides, and the Saladon soil is in swales and depressional areas.

Included in this unit are small areas of Barela soils on the upper part of side slopes, Dalcan and Raton soils in the steeper areas near the edge of mapped areas, and Rock outcrop along ridges and near the edge of mapped areas. Included areas make up about 20 percent of the total acreage.

The Yankee soil is deep and well drained. It formed in alluvium derived dominantly from basalt and modified with eolian material. Typically, the surface layer is dark brown loam 16 inches thick. The subsoil is brown silty clay 30 inches thick. The substratum to a depth of 60 inches or more is brown silty clay.

Permeability of the Yankee soil is slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is moderate.

The Saladon soil is deep and very poorly drained. It formed in fine textured alluvium derived dominantly from basalt. Typically, the upper 4 inches of the surface layer is very dark brown mucky silty clay loam and the lower 11 inches is very dark brown silty clay. The upper 15 inches of the substratum is dark gray clay, and the lower part to a depth of 60 inches or more is dark gray clay.

Permeability of the Saladon soil is very slow. Available water capacity is high. Effective rooting depth is 60 inches or more. Runoff is ponded during rainfall, and the hazard of water erosion is none. The hazard of soil blowing is slight. Frequent periods of flooding can occur during June through September. A fluctuating water table is at a depth of 0 to 4 feet.

Most areas of this unit are used for livestock grazing (fig. 16), wildlife habitat, and watershed. A few areas are used as nonirrigated cropland. The main crops are grass and legume hay. Some areas are used for recreation and urban development.

The potential natural plant community on the Yankee soil is mainly Arizona fescue, mountain muhly, prairie junegrass, western wheatgrass, needlegrass, and oatgrass. As the potential natural plant community deteriorates, the desirable forage plants such as Arizona fescue, prairie junegrass, and oatgrass decrease and there is an increase in blue grama, ring muhly, pingue, cinquefoil, and sagewort, which normally occur in small amounts in the potential natural plant community. Sleepygrass and Kentucky bluegrass readily invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of Arizona fescue, mountain muhly, and oatgrass.

The Yankee soil is suited to such rangeland management practices as rangeland seeding and mechanical brush management. Adapted plants suitable for seeding include improved varieties of Arizona fescue, mountain muhly, western wheatgrass, and prairie junegrass. Practices that facilitate rangeland management such as installation of fences, pipelines for providing stock water, watering facilities, and earthen ponds are suitable on this soil.

The potential natural plant community on the Saladon soil is mainly tufted hairgrass, mountain brome, western wheatgrass, sedges, and red fescue. As the potential natural plant community deteriorates, the desirable forage plants such as tufted hairgrass, mountain brome, sedges, and red fescue decrease and there is an increase in Baltic rush, iris, western yarrow, and shrubby cinquefoil, which normally occur in small amounts in the potential natural plant community. Dandelion and introduced forage grasses such as timothy, redtop, and Kentucky bluegrass readily invade. Grazing management should be designed to increase the vigor, productivity, and reproduction of tufted hairgrass and mountain brome. Grazing should be delayed until the soil is firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure. Other management practices suitable for use on this unit are

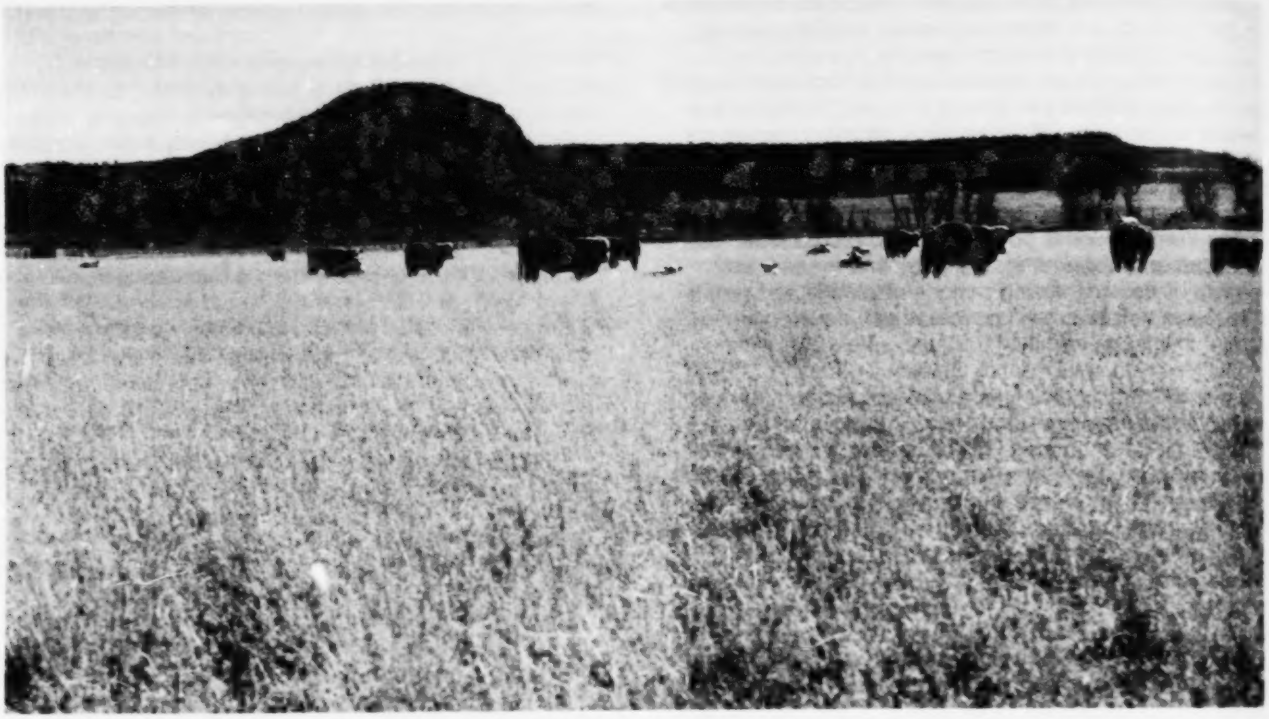

Figure 16.—Cattle grazing in area of Yankee-Saladon association, gently sloping.

proper grazing use, deferred grazing, rotation grazing, and spraying for brush management.

Forage production is less in areas where a central gully has formed as a result of water erosion.

The average annual production of air-dry vegetation on the Yankee soil ranges from 1,800 pounds per acre in favorable years to 600 pounds in unfavorable years.

The average annual production of air-dry vegetation on the Saladon soil ranges from 3,000 pounds per acre in favorable years to 2,000 pounds in unfavorable years.

If this unit is used for nonirrigated crops, the main limitations are the hazard of water erosion on the Yankee soil and frequent periods of flooding on the Saladon soil. The unit is suited to hay and pasture. Proper stocking rates, pasture rotation, and restricted grazing during wet periods help to keep the pasture in good condition and to protect the soils from water erosion. Periodic mowing and clipping help to maintain uniform growth, discourage selective grazing, and reduce clumpy growth. Grazing should be delayed until the soils in this unit are firm and the more desirable forage plants have achieved sufficient growth to withstand grazing pressure.

The Yankee soil is suited to recreational development. The main limitations are slow permeability and slope. The Saladon soil is poorly suited to recreational development. It is limited mainly by frequent periods of flooding.

The Yankee soil is suited to urban development. It is limited mainly by a high shrink-swell potential during alternate periods of wetting and drying. The Saladon soil is poorly suited to urban development. The main limitations are frequent periods of flooding and a high shrink-swell potential. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling excavations with material that has low shrink-swell potential.

Prime Farmland

Prime farmland, as defined by the United States Department of Agriculture, is the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It must either be used for producing food or fiber or be available for these uses. It has the soil quality, length of growing season, and moisture supply needed to economically produce a sustained high yield of crops when it is managed properly. Farming of prime farmland produces the highest yields with minimal energy and economic resources and results in the least disturbance to the environment.

Prime farmland commonly has an adequate and dependable supply of moisture from precipitation or irrigation. It also has a favorable temperature and length of growing season, an acceptable salt and sodium content, and an acceptable level of acidity or alkalinity. It has few, if any, rock fragments and is permeable to water and air. Prime farmland is not excessively eroded or saturated with water for long periods and is not flooded frequently during the growing season. Slope is mainly 0 to 5 percent, but it ranges to 8 percent. Soils that are limited by a hazard of flooding may qualify for prime farmland if this limitation is overcome. Onsite investigation is needed to determine the extent of this limitation.

In this survey area, an adequate and dependable supply of irrigation water of suitable quality is necessary to meet the requirements for prime farmland. About 115,900 acres, or about 10 percent, of the survey area meets the soil requirements for prime farmland. It is scattered throughout the area, but most is in the Mora and Watrous Valleys. Because of an undependable water supply and the small tracts of land, much of the prime farmland in the area is used for pasture or as rangeland. Crops grown on the cultivated prime farmland include small grain, grass hay, legumes, and some corn and sorghum.

The following map units meet the requirements for prime farmland if irrigated and, where necessary, protected from flooding. This list does not constitute a recommendation for a particular land use. The extent of each listed map unit is shown in table 2. The location of each unit is shown on the detailed soil maps at the back of this publication.

Bd	Breece Variant sandy loam, 3 to 8 percent slopes
Be	Brycan loam, 1 to 3 percent slopes
Hb	Hesperus sandy loam, 1 to 3 percent slopes
Hc	Hesperus sandy loam, 3 to 8 percent slopes
Ka	Kinesava sandy loam, 3 to 8 percent slopes
Kb	Kinesava loam, 1 to 3 percent slopes
La	La Brier silty clay loam, 0 to 3 percent slopes (if protected from flooding)
Mc	Manzano loam, 1 to 3 percent slopes (if protected from flooding)
Pa	Partri loam, 1 to 3 percent slopes
PB	Partri loam, gently sloping
Rf	Remunda loam, 1 to 3 percent slopes
Rh	Remunda clay loam, 0 to 2 percent slopes
RL	Remunda-Lavate Variant association, gently sloping
Sx	Swastika silty clay loam, 0 to 3 percent slopes

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavior characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

By Wesley A. Robbins, conservation agronomist, Soil Conservation Service.

General management needed for crops and pasture is suggested in this section. The crops or pasture plants best suited to the soils, including some not commonly grown in the survey area, are identified; the system of land capability classification used by the Soil Conservation Service is explained; and the estimated yields of the main crops and hay and pasture plants are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service, the Forest Service, or the Cooperative Extension Service.

From 5,000 to 7,000 acres of the survey area is irrigated cropland, and 6,000 to 7,000 acres is nonirrigated cropland. The cropland is mainly in the valleys along the Mora and Sapello Rivers, the Rito Cebello, and Coyote and Ocate Creeks. A small area of cropland is near the village of Wagon Mound.

The main crops grown are small grain, alfalfa, and improved and natural grasses. These crops are primarily used for hay and pasture. Some areas are used for corn, and other areas are used for orchard crops, vegetables, and Christmas trees. Christmas tree farming has shown good results where a high level of management is practiced. The survey area also has good potential for improved pasture to supplement ranching if a high level of management is used.

Each soil has specific limitations or hazards that restrict use to some extent. For example, Colomor soils are subject to a high hazard of soil blowing because of the texture of the surface layer and an accumulation of calcium carbonate. The Vermejo and Ceboya soils are severely limited by poor drainage, very slow permeability, the hazard of flooding, and salinity. The length of the growing season also restricts the type of crops that can be grown in some areas. Cool-season plants grow best in the survey area and are normally selected by land use managers.

Major objectives in cropland management are proper irrigation, maintaining good soil tilth and fertility, controlling soil blowing and water erosion, and conserving the limited amount of water available for irrigation. Use of crop rotation helps to keep the soils in good condition. Permanent improved grasses are needed on the soils in the more sloping areas. Soil fertility generally is low because low residue crops are grown and the cropland is grazed. A cropping system tailored to individual soils helps to maintain good soil tilth, soil structure, aeration, and fertility. Rotation of crops and the use of legumes increases fertility and reduces weeds, particularly sleepygrass.

Timely applications of adequate amounts of irrigation water without overirrigating are essential for high yields and water conservation. A properly designed irrigation system based on the soil characteristics and crops to be grown is needed. Overirrigation reduces yields because of the loss of fertility by leaching and water erosion and because of reduction of aeration in the root zone. It also causes excessive wetness in the lower lying areas because of runoff.

Water erosion is a problem in some of the steeper irrigated areas unless a properly designed irrigation system is installed. Land smoothing and leveling are also desirable on some soils to reduce runoff and increase the water intake rate.

Soil blowing is not a serious problem on most irrigated soils in the area. It is a potential problem, however, if proper crop residue or ground cover is not maintained in spring. Nonirrigated cropland is susceptible to soil blowing because the amount of residue produced is low and no vegetation is established in droughty years.

Overirrigation and seepage from irrigation canals have contributed to a high water table and poor drainage in some of the soils on flood plains and lower terraces. Proper irrigation of higher lying areas, lining of canals, and control of side drainageways reduce the accumulation of an excessive amount of water in low-lying areas.

Yield of annual crops, hay crops, and pasture plants can be increased by use of good management practices. These include proper irrigation, use of improved crop varieties, timely planting and harvesting, and a good fertilization program that is based on the needs of the soil and crops. Yields from nonirrigated cropland can be increased by the use of minimum tillage or crop residue, or both, to conserve soil and moisture. Other considerations that contribute to increased yields are weed, insect, and disease control.

Practices such as use of adequate fertilization, clipping after grazing to remove undesirable forage and weeds, harrowing to scatter the manure, and rotation grazing greatly increase yields of pasture plants.

Growing evergreen trees for Christmas trees takes 7 to 10 years. Trees should be pruned yearly for a dense, conical form. Site selection is an important factor in management. Areas of nearly level, loamy soils that are permeable to air and water are ideal. Sloping areas are subject to water erosion; therefore, they should be tilled on the contour and stubble should be left on the surface.

Irrigation should be at intervals of 2 weeks during the growing season for the first year, and thereafter only when the upper 12 inches of the soil becomes dry. Furrow irrigation is the most economical method of water distribution. The soil should be moist at the time of planting to prevent drying of the roots. Trees should be planted on the ridge. Planting in the furrow causes siltation and the eventual death of the trees because of stem rot. It is important to keep the tree rows free of weeds in a band at least 3 feet wide. Vegetation between the rows should be left standing for the first year to protect the trees from wind and sun.

Nursery stock is available either as bare root stock or container stock. Container stock has excellent survival rates, but it is more costly.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 3. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that insures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 3 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Rangeland

By Kenneth W. Williams, range conservationist, Soil Conservation Service.

Rangeland is land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. In areas that have similar climate and topography, the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on knowledge about the relationship between the soils and vegetation and water.

The potential natural plant community and the average annual production of vegetation in favorable and unfavorable years is given for each soil in the section "Detailed Soil Map Units."

The potential natural plant community is the association of plants that are best adapted to a unique combination of environmental factors. Even on the same soil, the proportion of these plants varies from place to place and from year to year. The dominant plant or plants are used to characterize the plant community because of their relative stability in areas where abnormal disturbance or deterioration has not occurred. The grasses, forbs, and shrubs that characterize the potential natural plant community on each major soil are listed by common name.

Once the plant community has been characterized for each soil, similar plant communities are grouped into range sites. A range site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from other natural plant communities in kind, amount, or proportion of range plants. Soil properties that have the greatest influence on the productivity of range plants are those that affect the availability of moisture and plant nutrients. Other soil properties, such as soil reaction, salt content, and the presence or absence of a high water table during any period of the year, are also important factors in differentiating range sites. Range site descriptions can be used to identify the proportions of the total annual production of each plant. Information on the range sites in this survey area is available in the local office of the Soil Conservation Service.

The average annual production is the amount of air-dry vegetation that can be expected to grow annually on well managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. The total production that can be used for forage depends upon the kind of grazing animals, the season of use, and other factors. The average annual production includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable and unfavorable years. In a favorable year, the amount and distribution of precipitation and the soil and air temperatures make growing conditions substantially better than average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Range management requires a knowledge of the kinds of soil and of the potential natural plant community. It also requires an evaluation of the present range condition. Range condition ratings (excellent, good, fair, and poor) are determined by comparing the present plant community with the potential natural plant community in a particular range site. The more closely the existing community resembles the potential community, the better the range condition.

The objective in range management is to control grazing so that the plants growing on a site are about the same in kind and amount as the potential natural plant community for that site. Such management generally results in the optimum production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Rangeland makes up approximately 75 percent of the survey area. It produces grass, shrubs, and forbs that are suitable for grazing or browsing. In addition, approximately 12 percent of the survey area is woodland that produces understory vegetation suitable for grazing by livestock. Livestock provides the principal agricultural income of the area.

The survey area is better suited to grazing in spring, summer, and fall because of the occasional severe winters. Many ranches in the area are yearlong cow-calf operations. Areas at higher elevations in the western parts of the survey area are used mainly in summer by cows, calves, or yearlings. In winter, most ranchers supplement the natural forage produced on the rangeland or woodland with high-quality hay or protein concentrates.

Flexibility in the number of livestock and in the frequency and intensity of grazing is essential to the success of any grazing program. Planned grazing systems that vary the season of grazing and rest in pastures during successive years result in a balanced plant community that provides a variety of high-quality forage plants throughout the year. Periodic rest during different seasons of the year benefits different plants. Rest in summer encourages the production and reproduction of warm-season grasses such as sideoats grama, alkali sacaton, galleta, and blue grama. Rest in spring is beneficial to cool-season grasses such as western wheatgrass and New Mexico feathergrass. Rest in fall and winter benefits shrubs such as fourwing saltbush and winterfat.

Additional information on rangeland management is given in the section "Detailed Soil Map Units."

Woodland Management and Productivity

By Robert D. Bruce, plant materials and woodland specialist, Soil Conservation Service.

Table 4 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The first part of the *ordination symbol*, a number, indicates the potential productivity of the soils for important trees. The number 1 indicates very high productivity; 2, high; 3, moderately high; 4, moderate; and 5, low. The second part of the symbol, a letter, indicates the major kind of soil limitation. The letter *x* indicates stoniness or rockiness; *w*, excessive water in or on the soil; *t*, toxic substances in the soil; *d*, restricted root depth; *c*, clay in the upper part of the soil; *s*, sandy texture; *f*, high content of coarse fragments in the soil profile; and *r*, steep slopes. The letter *o* indicates that limitations or restrictions are insignificant. If a soil has more than one limitation, the priority is as follows: x, w, t, d, c, s, f, and r.

In table 4, *slight, moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of *equipment limitation* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment is not limited to a particular kind of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that the expected mortality is less than 25 percent; *moderate*, 25 to 50 percent; and *severe*, more than 50 percent.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate* indicates that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; *severe* indicates that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants.

The *potential productivity* of merchantable or *common trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years (*5, 6, 8*). The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

Trees to plant are those that are suited to the soils and to commercial wood production.

About 250,000 acres, or about 22 percent, of the survey area is woodland. Ponderosa pine, Douglas-fir, white fir, and Englemann spruce are the major commercial timber species in the area. Englemann spruce is the major species in areas above 9,500 feet in elevation. Douglas-fir and white fir grow best in areas between 8,000 and 9,500 feet. Ponderosa pine grows best in areas between 7,000 and 8,500 feet, but it also grows in areas at 6,500 feet.

Aspect has a strong influence on tree growth. For example, areas on south-facing slopes at an elevation of 8,500 feet support mostly pure stands of ponderosa pine, but areas on cooler, north-facing slopes at the same elevation support Douglas-fir, white fir, and aspen.

The main timber producing soils are those of the Cundiyo, Dargol, Etown, Etoe, Maes, and Rocio series. Other important wooded soils are those of the Dalcan, Firo, Fuera, Raton, and Spud series and the Nambe Variant.

Approximately 26 percent of the woodland supports pinyon and juniper. Pinyon and juniper are common at elevations of 6,000 to 7,000 feet, but they will grow in areas on south-facing slopes at an elevation of 8,000 feet. The demand for pinyon and juniper continues to increase. Although they are not considered commercial species, they are used extensively for firewood and fenceposts. Pinyon is also used for Christmas trees and as ornamentals for homes. It also produces edible nuts. Most of the understory in areas of pinyon and juniper is used for livestock grazing. Many areas of pinyon and juniper are very dense and should be managed by thinning or other practices to obtain maximum production. The soils that support the best stands of pinyon and juniper are those in the Sombordoro and Tuloso series.

Good forest management practices include protection from fire and from insects and disease, thinning and pruning to improve growth and quality, reforestation, cutting to improve the stocking level, and good management of the watershed.

Fire protection is provided by firemen from adjacent Forest Service land, by private individuals, and by use of fire lanes and other structures. Proper silvicultural practices provide protection from insects and disease. Thinning and pruning of selected trees improve the quality of the timber and the growth potential of the site.

Reforestation is achieved by natural regeneration and by seeding and planting. Treating skid areas, roads, landings, and other areas disturbed by logging operations, constructing water bars, cross ditching, and seeding to grass, forbs, and browse reduce water erosion.

Additional information on management of the woodland is given in the section "Detailed Soil Map Units."

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive.

The understory plant species, production, and practices for management of woodland understory vegetation are given in the section "Detailed Soil Map Units."

Windbreaks and Environmental Plantings

Windbreaks protect livestock, buildings, and yards from wind and snow. They also protect fruit trees and gardens, and they furnish habitat for wildlife. Several rows of low- and high-growing broadleaf and coniferous trees and shrubs provide the most protection.

Field windbreaks are narrow plantings made at right angles to the prevailing wind and at specific intervals across the field. The interval depends on the erodibility of the soil. Field windbreaks protect cropland and crops from wind, hold snow on the fields, and provide food and cover for wildlife.

Environmental plantings help to beautify and screen houses and other buildings and to abate noise. The plants, mostly evergreen shrubs and trees, are closely spaced. To insure plant survival, a healthy planting stock of suitable species should be planted properly on a well prepared site and maintained in good condition.

Field windbreaks are beneficial on soils in the Colmor, La Brier, Manzano, Partri, Remunda, and Swastika series. All species planted for windbreaks in the survey area require irrigation to become established and to maintain growth. Suitable shrubs include Amur honeysuckle, elderberry, lilac, serviceberry, smooth sumac, and Tartarian honeysuckle. Suitable tree species include pinyon, ponderosa pine, Rocky Mountain juniper, Siberian elm, and white mulberry. Further information on windbreaks can be obtained from the local office of the Soil Conservation Service.

Recreation

By Edwin A. Swenson, biologist, Soil Conservation Service.

The soils of the survey area are rated in table 5 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreation use by the duration and intensity of flooding and the season when flooding occurs. In planning recreation facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 5, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties are generally favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, limited use, or by a combination of these measures.

The information in table 5 can be supplemented by other information in this survey, for example, interpretations for septic tank absorption fields in table 8 and interpretations for dwellings without basements and for local roads and streets in table 7.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils have mild slopes and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

By Edwin A. Swenson, biologist, Soil Conservation Service.

Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. The kind and abundance of wildlife depend largely on the amount and distribution of food, cover, and water. Wildlife habitat can be created or improved by planting appropriate vegetation, by maintaining the existing plant cover, or by promoting the natural establishment of desirable plants.

In table 6, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs.

Grain and seed crops are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and barley.

Grasses and legumes are domestic perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flood hazard, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are fescue, lovegrass, bromegrass, clover, and alfalfa.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flood hazard. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are bluestem, galleta, feathergrass, wheatgrass, sacaton, globemallow, and grama.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are pinyon, ponderosa pine, spruce, Douglas-fir, and juniper.

Shrubs are bushy woody plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are Apacheplume, oak brush, skunkbush, mountainmahogany, snowberry, and winterfat.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetland plants are smartweed, wild millet, saltgrass, rushes, sedges, and cattail.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs.

Habitat for openland wildlife consists of cropland, pasture, meadows, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. The wildlife attracted to these areas include quail, magpie, horned lark, mourning dove, meadowlark, cottontail, striped skunk, and coyote.

Habitat for woodland wildlife consists of areas of deciduous plants or coniferous plants or both and associated grasses, legumes, and wild herbaceous plants. Wildlife attracted to these areas include wild turkey, grouse, woodpeckers, squirrels, coyote, raccoon, mule deer, elk, and black bear.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas are ducks, geese, herons, shore birds, raccoon, mink, and beaver.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland include antelope, jackrabbit, prairie dog, coyote, mule deer, meadowlark, and lark bunting.

Engineering

By Walter E. Gassman, Jr., area engineer, Soil Conservation Service.

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building site development, Sanitary facilities, Construction materials, and Water management. The ratings are based on observed performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 7 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; stone content; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills are generally limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil), shrink-swell potential, frost action potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, the available water capacity in the upper 40 inches, and the content of salts, sodium, and sulfidic materials affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 8 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 8 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates th soil properties and site features are favorable for the us and good performance and low maintenance can be expected; *fair* indicates that soil properties and site features are moderately favorable for the use and one o more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, o costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneat the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the soli and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 8 gives ratings for the natural soil that makes u the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 8 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 9 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 9, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the soil series descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a probable source has a layer of clean sand or gravel or a layer of sand or gravel that is up to 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an improbable source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils is generally preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 10 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features are generally favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features, listed in tables, are explained on the following pages.

Soil properties are determined by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine grain-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 11 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 or 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (*2, 7*) and the system adopted by the American Association of State Highway and Transportation Officials (*1*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number. Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 12 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each soil series under "Soil Series and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, and plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, greater than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (up to 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their resistance to wind erosion in cultivated areas. The groups indicate the susceptibility of soil to wind erosion and the amount of soil lost. Soils are grouped according to the amount of stable aggregates 0.84 millimeters in size. These are represented idealistically by USDA textural classes. Soils containing rock fragments can occur in any group.

1. Sands, fine sands, and very fine sands. These soils are generally not suitable for crops. They are extremely erodible, and vegetation is difficult to establish.

2. Loamy sands, loamy fine sands, and loamy very fine sands. These soils are very highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

3. Sandy loams, coarse sandy loams, fine sandy loams, and very fine sandy loams. These soils are highly erodible. Crops can be grown if intensive measures to control wind erosion are used.

4L. Calcareous loamy soils that are less than 35 percent clay and more than 5 percent finely divided calcium carbonate. These soils are erodible. Crops can be grown if intensive measures to control wind erosion are used.

4. Clays, silty clays, clay loams, and silty clay loams that are more than 35 percent clay. These soils are moderately erodible. Crops can be grown if measures to control wind erosion are used.

5. Loamy soils that are less than 18 percent clay and less than 5 percent finely divided calcium carbonate and sandy clay loams and sandy clays that are less than 5 percent finely divided calcium carbonate. These soils are slightly erodible. Crops can be grown if measures to control wind erosion are used.

6. Loamy soils that are 18 to 35 percent clay and less than 5 percent finely divided calcium carbonate, except silty clay loams. These soils are very slightly erodible. Crops can easily be grown.

7. Silty clay loams that are less than 35 percent clay and less than 5 percent finely divided calcium carbonate. These soils are very slightly erodible. Crops can easily be grown.

8. Stony or gravelly soils and other soils not subject to wind erosion.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 12, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 13 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary inundation of an area, is caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, nor is water in swamps and marshes.

Table 13 gives the frequency and duration of flooding and the time of year when flooding is most likely.

Frequency, duration, and probable dates of occurrence are estimated. Frequency is expressed as none, rare, common, occasional, and frequent. *None* means that flooding is not probable; *rare* that it is unlikely but possible under unusual weather conditions; *common* that it is likely under normal conditions; *occasional* that it occurs, on the average, no more than once in 2 years; and *frequent* that it occurs, on the average, more than once in 2 years. Duration is expressed as *very brief* if less than 2 days, *brief* if 2 to 7 days, and *long* if more than 7 days. Probable dates are expressed in months; November-May, for example, means that flooding can occur during the period November through May.

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons that form in soils that are not subject to flooding.

Also considered are local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Cemented pans are cemented or indurated subsurface layers within a depth of 5 feet. Such pans cause difficulty in excavation. Pans are classified as thin or thick. A thin pan is less than 3 inches thick if continuously indurated or less than 18 inches thick if discontinuous or fractured. Excavations can be made by trenching machines, backhoes, or small rippers. A thick pan is more than 3 inches thick if continuously indurated or more than 18 inches thick if discontinuous or fractured. Such a pan is so thick or massive that blasting or special equipment is needed in excavation.

Potential frost action is the likelihood of upward or lateral expansion of the soil caused by the formation of segregated ice lenses (frost heave) and the subsequent collapse of the soil and loss of strength on thawing. Frost action occurs when moisture moves into the freezing zone of the soil. Temperature, texture, density, permeability, content of organic matter, and depth to the water table are the most important factors considered in evaluating the potential for frost action. It is assumed that the soil is not insulated by vegetation or snow and is not artificially drained. Silty and highly structured clayey soils that have a high water table in winter are most susceptible to frost action. Well drained, very gravelly, or very sandy soils are the least susceptible. Frost heave and low soil strength during thawing cause damage mainly to pavements and other rigid structures.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*10*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 14 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (*Ust*, meaning burnt, plus *oll*, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiustolls (*Argil*, meaning an increase in clay content, plus *ustoll*, the suborder of the Mollisols that have an ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Aridic* identifies the subgroup that is drier than is typical for the great group. An example is Aridic Argiustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, depth of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine, mixed, mesic Aridic Argiustolls.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each series. The soil is compared with similar soils and with nearby soils of other series. A pedon, a small three-dimensional area of soil, that is typical of the series in the survey area is described. The detailed description of each soil horizon follows standards in the Soil Survey Manual (*9*). Many of the technical terms used in the descriptions are defined in Soil Taxonomy (*10*). Following the pedon description is the range of important characteristics of the soils in the series.

The map units of each soil series are described in the section "Detailed Soil Map Units."

Apache Series

The soils in the Apache series are classified as loamy, mixed, mesic Lithic Haplustolls (fig. 17). These shallow, well drained soils formed in residuum derived from basalt and modified with eolian material. They are on basalt mesas, along ridges, and on the upper side slopes in areas of basalt flows. Slope is 1 to 15 percent. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 17 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 155 days.

Typical pedon of an Apache very stony loam in an area of Apache-Rock outcrop complex, moderately

Figure 17.—Prairie rattlesnake on an Apache very stony loam in an area of Apache-Rock outcrop complex, moderately sloping.

sloping; about halfway up the southeastern side of Maxson Crater, near the center of sec. 18, T. 19 N., R. 20 E.; in the Mora Land Grant.

A11—0 to 3 inches; dark grayish brown (10YR 4/2) very stony loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; 20 percent stones, 20 percent cobbles, and 10 percent pebbles; trace of caliche fragments less than 3 inches in diameter on the surface; strongly effervescent; 3 percent calcium carbonate equivalent; mildly alkaline; clear smooth boundary.

A12—3 to 7 inches; dark grayish brown (10YR 4/2) stony heavy loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine and medium tubular pores; few small soft calcium carbonate accumulations; 7 percent stones, 7 percent cobbles, 10 percent pebbles, and few caliche fragments less than 3 inches in diameter; strongly effervescent; 7 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

B2ca—7 to 13 inches; dark grayish brown (10YR 4/2) stony light clay loam, very dark grayish brown (10YR 3/2) moist; weak and moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots and few fine roots; many fine and medium tubular pores; common small calcium carbonate accumulations ranging from soft nodules to hard concretions; 10 percent stones, 5 percent cobbles, 15 percent pebbles, and few caliche pebbles and cobbles; violently effervescent; 10 percent calcium carbonate equivalent; moderately alkaline; abrupt wavy boundary.

R—13 inches; hard basalt; fractures 1 to 2 inches deep in surface in places; coating of carbonates on surface and few pockets of calcium carbonate accumulation on wavy basalt contact.

Depth to bedrock ranges from 5 to 18 inches. Some pedons have thin, hard, discontinuous and laminar calcium carbonate accumulations on the basalt contact.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or silt loam and is 15 to 50 percent rock fragments.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 to 5 when moist, and chroma of 2 to 4 when dry or moist. It is loam to clay loam and is 15 to 35 percent rock fragments.

Some pedons have a thin Cca horizon.

Argiustolls

Argiustolls are extremely variable in their characteristics. They are moderately deep and deep, well drained soils that formed in alluvial, colluvial, and residual material derived mainly from basalt. These soils are on side slopes of basalt-capped mesas and on benches on canyon walls in areas of basalt flows. Slope is 30 to 65 percent. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 155 days.

Sample pedon of Argiustolls in an area of Argiustolls-Rock outcrop complex, extremely steep; about halfway up the eastern part of Las Mesas del Conjelon from Raska headquarters; in the NE1/4 of sec. 8, T. 20 N., R. 22 E.

A1—0 to 10 inches; dark grayish brown (10YR 4/2) stony silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; loose, very friable, slightly sticky and plastic; many very fine and fine roots; many fine interstitial pores; 10 percent stones, 10 percent cobbles, and 10 percent pebbles; mildly alkaline; clear smooth boundary.

B2t—10 to 20 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; many very fine and fine roots; many very fine and fine tubular pores; common thin clay films on faces of peds; less than 5 percent rock fragments; mildly alkaline; clear smooth boundary.

B3tca—20 to 31 inches; pale brown (10YR 6/3) heavy silty clay, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine and fine tubular pores; common thin clay films on faces of peds; less than 5 percent rock fragments; slightly effervescent; moderately alkaline; clear smooth boundary.

B3ca—31 to 45 inches; brown (10YR 5/3) gravelly clay loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots; common very fine tubular pores; 15 to 35 percent pebbles; violently effervescent; moderately alkaline; abrupt wavy boundary.

Cr—45 inches; brown, soft basaltic material.

The profile is 28 to 60 inches thick. The mollic epipedon is 10 to 20 inches thick. The surface layer is 20 to 80 percent cobbles, pebbles, and stones. The B and C horizons are less than 5 to 95 percent rock fragments. The profile is loam to clay. Content of calcium carbonate in the control section ranges from a trace to 35 percent. Hue is 2.5Y, 10YR, 7.5YR, or 5YR throughout the profile.

Ayon Series

The soils in the Ayon series are classified as loamy-skeletal, mixed, mesic Aridic Calciustolls. These deep, well drained soils formed in alluvial and colluvial deposits derived mainly from basalt. They are on mesas and side slopes in areas of basalt flows. Slope is 2 to 30 percent. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 155 days.

Typical pedon of an Ayon stony loam in an area of Apache-Ayon complex, gently sloping; about 0.5 mile northwest of Wagon Mound, along New Mexico Highway 120; in the NW1/4NE1/4 of sec. 33, T. 21 N., R. 21 E.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; 10 percent stones and 10 percent cobbles; carbonate coatings on undersides of rock fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

AC—3 to 18 inches; grayish brown (10YR 5/2) stony heavy loam, very dark grayish brown (10YR 3/2) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; many very fine, fine, and medium roots; many fine and medium tubular pores and common coarse tubular pores; 20 percent stones and cobbles; carbonate coatings on undersides of rock fragments; violently effervescent; moderately alkaline; clear wavy boundary.

C1ca—18 to 24 inches; white (10YR 8/1) very stony loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many fine and common medium tubular pores; 20 percent stones, 20 percent cobbles, and 20 percent pebbles; thick coatings of lime on undersides of rock fragments; common discontinuous layers of strongly cemented and laminar indurated caliche; violently effervescent; 40 percent calcium carbonate equivalent; moderately alkaline; gradual irregular boundary.

C2ca—24 to 60 inches; very pale brown (10YR 8/3) extremely stony loam, very pale brown (10YR 7/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many fine tubular pores and common very fine and medium tubular pores; 40 percent stones, 20 percent cobbles, and 20 percent pebbles; thick coatings of lime on undersides of rock fragments; common discontinuous layers of strongly cemented and laminar indurated caliche; violently effervescent; 35 percent calcium carbonate equivalent; moderately alkaline.

Depth to the calcic horizon ranges from 18 to 33 inches. The control section is 35 to 80 percent rock fragments, dominantly calcium carbonate-coated basalt cobbles and stones.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 1 to 3 when dry or moist. It is stony loam or very stony loam.

The Cca horizon has hue of 7.5YR or 10YR, value of 5 to 8 when dry and 4 to 7 when moist, and chroma of 1 to 4. It is loam, sandy clay loam, or silty clay loam and is 45 to 80 percent rock fragments. The Cca horizon is 15 to 50 percent calcium carbonate equivalent.

Barela Series

The soils in the Barela series are classified as fine, mixed Typic Argiborolls. These deep, well drained soils formed in residuum derived mainly from basalt. They are on side slopes and mesas in areas of basalt flows. Slope is 3 to 9 percent. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of a Barela loam in an area of Barela-Yankee association, gently sloping; about 8.5 miles south of Ocate, along New Mexico Highway 21 and 1 mile east; in the east half of sec. 35, T. 21 N., R. 17 E.; in the Mora Land Grant.

A1—0 to 3 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and few coarse roots; 5 percent basalt cobbles; neutral; clear smooth boundary.

B1—3 to 11 inches; reddish brown (5YR 4/3) heavy loam, dark reddish brown (5YR 3/3) moist; weak coarse subangular blocky structure parting to moderate medium and coarse granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few coarse roots; many very fine and fine tubular pores and common medium tubular pores; 5 percent basalt stones and cobbles; neutral; clear wavy boundary.

B21t—11 to 16 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, friable, slightly sticky and plastic; few very fine and fine roots; few very fine and fine tubular pores; few thin clay films on faces of peds; 5 percent basalt stones and cobbles; mildly alkaline; clear wavy boundary.

B22t—16 to 26 inches; reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium and coarse subangular blocky; very hard, firm, sticky and plastic; few fine roots; many very fine and fine tubular pores; common thin clay films on faces of peds; 10 percent basalt stones and cobbles; mildly alkaline; clear wavy boundary.

B23t—26 to 45 inches; reddish brown (5YR 5/4) stony heavy clay loam, reddish brown (5YR 4/4) moist; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; many very fine and fine tubular pores; common thin clay films on faces of peds; 15 percent basalt stones and cobbles; mildly alkaline; abrupt wavy boundary.

R—45 inches; hard basalt.

Depth to bedrock and thickness of the solum range from 40 to 60 inches or more. Some pedons have a C horizon. The mollic epipedon ranges from 11 to 15 inches in thickness. Rock fragments in the profile are stones, cobbles, and pebbles. The A horizon is a trace to 10 percent rock fragments, the upper 20 inches of the

B2t horizon is 5 to 15 percent, and the lower part of the B2t horizon is 15 to 35 percent.

The A horizon has value of 3 or 4 when dry and 2 or 3 when moist, and it has chroma of 2 or 3 when dry or moist. It is loam or silt loam.

The B21t and B22t horizons have hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4. They are heavy clay loam, silty clay loam, or silty clay and are 35 percent clay or more.

Bernal Series

The soils in the Bernal series are classified as loamy, mixed, mesic Lithic Argiustolls. These shallow, well drained soils formed in residuum derived mainly from sandstone and modified with eolian material. They are along ridges, hills, and drainageways and on the upper side slopes of uplands. Slope is 3 to 20 percent. Elevation is 5,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Bernal loam in an area of Partri-Carnero-Bernal association, undulating; about 20 miles southeast of Wagon Mound, along New Mexico Highway 271; in the NW1/4SE1/4 of sec. 31, T. 18 N., R. 24 E.

A1—0 to 4 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; weak very fine granular structure; loose, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; moderately alkaline; clear smooth boundary.

B1—4 to 9 inches; brown (7.5YR 5/2) heavy loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; moderately alkaline; clear smooth boundary.

B2t—9 to 19 inches; reddish brown (5YR 4/4) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak very coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; many fine tubular pores; many moderately thick clay films on faces of peds; moderately alkaline; abrupt wavy boundary.

R—19 inches; hard, red sandstone.

Thickness of the solum and depth to bedrock range from 10 to 19 inches. The profile is a trace to 20 percent rock fragments throughout. Some pedons have a thin layer of calcium carbonate accumulation on the lithic contact.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or stony loam.

Most pedons have a B1 or B1t horizon that is similar in color to the A horizon to a depth of 9 or 10 inches. The B1 or B1t horizon is heavy loam or sandy clay loam. The B2t horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is heavy loam, sandy clay loam, or light clay loam.

Breece Variant

The soils in the Breece Variant are classified as coarse-loamy, mixed Cumulic Haploborolls. These deep, somewhat excessively drained soils formed in alluvial sediment derived mainly from mixed metamorphic rock. They are on convex alluvial fans near mountain drainageways. Slope is 3 to 8 percent. Elevation is 7,400 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of Breece Variant sandy loam, 3 to 8 percent slopes; about 2.5 miles north-northeast of Mora, along New Mexico Highway 38; in the NW1/4 of sec. 31, T. 21 N., R. 16 E.; in the Mora Land Grant.

A11—0 to 3 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; loose, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine interstitial pores; common fine mica flakes; neutral; clear smooth boundary.

A12—3 to 10 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine and medium tubular pores; common fine mica flakes; neutral; clear wavy boundary.

B1—10 to 18 inches; brown (10YR 4/3) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine, fine, and medium roots; many fine and medium tubular pores; 2 percent quartz pebbles; common fine mica flakes; mildly alkaline; clear wavy boundary.

C1—18 to 30 inches; yellowish brown (10YR 5/4) sandy loam, brown (10YR 4/3) moist; common dark yellowish brown (10YR 4/4) streaks; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many fine and medium tubular pores; 2 percent quartz pebbles; common fine mica flakes; mildly alkaline; gradual wavy boundary.

C2—30 to 60 inches; brown (10YR 5/3) sandy loam, brown (10YR 4/3) moist; common dark yellowish brown (10YR 4/4) streaks; massive; soft, very friable, nonsticky and nonplastic; few fine roots in upper part; many fine and medium tubular pores; 5

percent quartz pebbles; common fine mica flakes; mildly alkaline.

The mollic epipedon is 18 to 40 inches thick. Few to many fine mica flakes are throughout most pedons.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is 0 to 5 percent cobbles and pebbles.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It commonly is sandy loam, but it is loam in some pedons. The horizon is stratified in the lower part in some pedons. It is 0 to 10 percent cobbles and pebbles.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4 when dry or moist. It commonly is sandy loam, but it is loam in some pedons. The horizon is stratified in most pedons. It is 0 to 10 percent cobbles and pebbles.

Brycan Series

The soils in the Brycan series are classified as fine-loamy, mixed Cumulic Haploborolls. These deep, well drained soils formed in alluvial material derived mainly from sandstone and shale. They are in the lower lying areas in alluvial mountain valleys. Slope is 1 to 8 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the frost-free period is 85 to 100 days.

Typical pedon of Brycan loam, 1 to 3 percent slopes; about 2 miles northeast of North Carmen; in the northeast corner of the NW1/4 of sec. 36, T. 20 N., R. 15 E.; in the Mora Land Grant.

A11—0 to 2 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium granular structure; loose, nonsticky and nonplastic; many very fine and fine roots; many fine interstitial pores; mildly alkaline; clear smooth boundary.

A12—2 to 8 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak coarse subangular blocky structure parting to weak medium granular; loose, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; mildly alkaline; clear smooth boundary.

B1—8 to 20 inches; dark brown (7.5YR 4/2) heavy loam, dark brown (7.5YR 3/2) moist; weak coarse prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine tubular pores; mildly alkaline; clear smooth boundary.

B2—20 to 33 inches; dark brown (7.5YR 4/2) clay loam, dark brown (7.5YR 3/2) moist; strong coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine tubular pores; mildly alkaline; clear smooth boundary.

B3—33 to 42 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; strong coarse prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few fine tubular pores; mildly alkaline; clear smooth boundary.

C—42 to 60 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive; hard, friable, nonsticky and nonplastic; mildly alkaline.

The mollic epipedon ranges from 20 to 36 inches thick.

The A1 horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 to 4 when dry and 1 to 3 when moist.

The B2 horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is loam, sandy clay loam, or clay loam.

The C horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 to 5 when dry or moist. It is loam, sandy clay loam, or heavy sandy loam.

Burnac Series

The soils in the Burnac series are classified as fine, montmorillonitic Mollic Eutroboralfs. These deep, well drained soils formed in residuum derived mainly from basalt. They are on basalt mesas and on the upper part of mountainsides in areas of basalt flows. Slope is 5 to 40 percent. Elevation is 8,000 to 11,000 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 40 to 45 degrees F, and the frost-free period is 80 to 100 days.

Typical pedon of a Burnac stony loam in an area of Spud-Burnac association, very steep; about 1.5 miles south of county line, on Ocate Mesa; on the SW1/4 of sec. 5, T. 23 N., R. 17 E.; in the Mora Land Grant.

O—2 inches to 0; decomposing forest litter.

A1—0 to 7 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak very fine and fine granular structure; loose, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many very fine and fine interstitial pores; 10 percent stones, 20 percent cobbles, and a trace of pebbles; neutral; clear smooth boundary.

A2—7 to 15 inches; brown (7.5YR 5/2) stony loam, dark brown (7.5YR 4/2) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine, medium, and coarse tubular pores; 10 percent stones, 15 percent cobbles, and 5 percent pebbles; neutral; clear wavy boundary.

B21t—15 to 23 inches; brown (7.5YR 5/4) silty clay, brown (7.5YR 4/4) moist; strong medium and coarse subangular blocky structure; hard, firm, sticky and plastic; many fine, medium, and coarse roots; many very fine and fine tubular pores; many thin clay films on faces of peds; 5 percent cobbles; neutral; clear wavy boundary.

B22t—23 to 30 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; strong medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; many fine, medium, and coarse roots; many very fine and fine tubular pores; many thin clay films on faces of peds; 5 percent cobbles; neutral; clear wavy boundary.

B23t—30 to 37 inches; reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; strong medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; many fine, medium, and coarse roots; many very fine and fine tubular pores; many thin clay films on faces of peds; 8 percent stones and cobbles; neutral; clear wavy boundary.

C—37 to 60 inches; reddish brown (5YR 5/4) very stony silty clay, reddish brown (5YR 4/4) moist; massive; very hard, very firm, very sticky and very plastic; common fine and medium roots in upper part and few fine roots in lower part; many fine tubular pores; 40 percent stones and cobbles; neutral; abrupt wavy boundary.

R—60 inches; hard basalt.

Depth to bedrock ranges from 40 to 60 inches. The solum is 30 to 40 inches thick. The profile is 15 to 30 percent rock fragments above the control section, 2 to 8 percent in the control section, and 30 to 50 percent below the control section.

The A1 horizon has hue of 10YR or 7.5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The A2 horizon has value of 4 or 5 when dry and 3 or 4 when moist, and it has chroma of 2 to 4 when dry or moist.

The B2t horizon has hue of 7.5YR or 5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 3 or 4 when dry or moist. It is clay or silty clay.

Capulin Series

The soils in the Capulin series are classified as fine-loamy, mixed, mesic Aridic Argiustolls. These deep, well drained soils formed in alluvial material derived mainly from basalt and modified with eolian material. They are on side slopes in areas of basalt flows. Slope is 1 to 8 percent. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 155 days.

Typical pedon of a Capulin loam in an area of Charette-Capulin association, gently undulating; about 4 miles southeast of Wagon Mound, along New Mexico Highway 271; in the NE1/4 of sec. 19, T. 20 N., R. 22 E.

A1—0 to 12 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; slightly effervescent; mildly alkaline; clear wavy boundary.

B21t—12 to 18 inches; brown (10YR 5/3) clay loam, brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, very friable, sticky and plastic; common fine roots; many fine tubular pores; common thin clay films on faces of peds; slightly effervescent; mildly alkaline; clear wavy boundary.

B22t—18 to 28 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; moderate medium prismatic structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common fine roots; many fine tubular pores; many thin clay films on faces of peds; strongly effervescent; mildly alkaline; clear wavy boundary.

B23t—28 to 35 inches; light yellowish brown (10YR 6/4) silty clay loam, yellowish brown (10YR 5/4) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; many fine tubular pores; common thin clay films on faces of peds; strongly effervescent; mildly alkaline; clear wavy boundary.

C1ca—35 to 44 inches; very pale brown (10YR 7/4) silt loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many fine tubular pores; violently effervescent; mildly alkaline; clear wavy boundary.

C2ca—44 to 60 inches; very pale brown (10YR 7/3) silt loam, light yellowish brown (10YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; many fine tubular pores; 10 percent cobbles; violently effervescent; 15 percent calcium carbonate equivalent; mildly alkaline.

The solum is 25 to 35 inches thick. The depth to bedrock is more than 60 inches. The control section is 0 to 15 percent cobbles or pebbles.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The Bt horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4 when dry or moist. It is heavy loam, silty clay loam, or clay loam.

The C horizon is cobbly in some pedons. It is 15 percent calcium carbonate equivalent or more.

Carnero Series

The soils in the Carnero series are classified as fine, mixed, mesic Aridic Argiustolls. These moderately deep, well drained soils formed in residuum derived mainly from sandstone and modified with eolian material. They are in slightly convex areas on upland side slopes along low hills and ridges. Slope is 2 to 5 percent. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Carnero loam in an area of Partri-Carnero-Bernal association, undulating; about 20 miles southeast of Wagon Mound, along New Mexico Highway 271; in the NW1/4SE1/4 of sec 31, T. 18 N., R. 24 E.

A1—0 to 3 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; moderate very fine granular structure; loose, very friable, nonsticky and nonplastic; many fine roots; many fine interstitial pores; moderately alkaline; clear smooth boundary.

B1—3 to 9 inches; brown (7.5YR 5/2) heavy loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; moderately alkaline; clear smooth boundary.

B21t—9 to 16 inches; reddish brown (5YR 4/4) silty clay loam, dark reddish brown (5YR 3/4) moist; weak very coarse prismatic structure parting to moderate medium and fine subangular blocky; hard, firm, sticky and plastic; common very fine and fine roots; common fine tubular pores; many moderately thick clay films on faces of peds; moderately alkaline; clear smooth boundary.

B22t—16 to 28 inches; reddish brown (5YR 4/4) silty clay, dark reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; common very fine and fine roots; many fine tubular pores; many thin clay films on faces of peds; moderately alkaline; abrupt wavy boundary.

R—28 inches; hard, red sandstone.

Thickness of the solum ranges from 16 to 35 inches. Depth to bedrock ranges from 25 to 35 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The B2t horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is clay loam, silty clay loam, or silty clay and is more than 35 percent clay. The horizon is noneffervescent to effervescent in the lower part.

Some pedons have a thin C horizon that commonly is effervescent above the lithic contact.

Ceboya Series

The soils in the Ceboya series are classified as fine, mixed, frigid Typic Haplaquolls. These deep, very poorly drained soils formed in fine textured alluvial sediment derived from various kinds of rock. They are on broad mountain valley flood plains. Slope is 0 to 1 percent. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of Ceboya silty clay loam, 0 to 1 percent slopes; in the village of Mora, about 400 feet south of New Mexico Highway 3, along the fence; in the NE1/4 of sec. 14, T. 20 N., R. 15 E.; in the Mora Land Grant.

O—1 inch to 0; dense sod of decomposing plant material and fibrous roots.

A11—0 to 9 inches; very dark gray (5Y 3/1) silty clay loam, dark gray (5Y 4/1) dry; weak medium subangular blocky structure; hard, friable, sticky and plastic; many very fine, fine, and medium roots; common very fine tubular pores; few fine mica flakes; slightly effervescent; mildly alkaline; clear smooth boundary.

A12—9 to 14 inches; very dark grayish brown (2.5Y 3/2) heavy silty clay loam, dark grayish brown (2.5Y 4/2) dry; few fine distinct olive brown (2.5Y 4/4) mottles, light olive brown (2.5Y 5/4) dry; massive; very hard, firm, sticky and very plastic; many very fine, fine and medium roots; common very fine tubular pores; few fine mica flakes; slightly effervescent; mildly alkaline; clear wavy boundary.

C1g—14 to 23 inches; dark grayish brown (2.5Y 4/2) heavy silty clay loam, grayish brown (2.5Y 5/2) dry; many large prominent light olive brown (2.5Y 5/6) mottles, olive yellow (2.5Y 6/6) when dry; massive; very hard, firm, sticky and very plastic; many very fine, fine, and medium roots; few fine mica flakes; mildly alkaline; clear wavy boundary.

C2g—23 to 41 inches; dark gray (N 4/0) silty clay, gray (N 5/0) dry; common medium prominent light olive brown (2.5Y 5/4) mottles, light yellowish brown (2.5Y 6/4) when dry; massive; extremely hard, very firm, very sticky and very plastic; many very fine, fine, and medium roots; few very fine tubular pores; few fine mica flakes; mildly alkaline; gradual wavy boundary.

C3g—41 to 60 inches; dark gray (N 4/0) clay, gray (N 5/0) dry; few fine distinct light olive brown (2.5Y 5/6) mottles, olive yellow (2.5Y 6/6) dry; massive;

extremely hard, very firm, very sticky and very plastic; few fine roots; few very fine tubular pores; few fine mica flakes; 5 percent quartz pebbles; mildly alkaline.

Some pedons have a B horizon, and most pedons have few fine mica flakes.

The A horizon has hue of neutral, 10YR, 2.5Y, or 5Y, value of 3 to 5 when dry and 2 to 4 when moist, and chroma of 0 to 2 when dry or moist.

The C horizon has hue of neutral, 10YR, 2.5Y, or 5Y, value of 4 to 6 when dry and 2 to 4 when moist, and chroma of 0 to 2 when dry or moist. It is silty clay loam or clay loam in the upper part and silty clay or clay in the lower part. The lower part is 0 to 10 percent quartz pebbles.

Charette Series

The soils in the Charette series are classified as fine, mixed, mesic Aridic Argiustolls. These deep, well drained soils formed in alluvial sediment derived mainly from basalt and modified with eolian material. They are on side slopes in areas of basalt flows. Slope is 0 to 4 percent. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches. The average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 155 days.

Typical pedon of a Charette loam in an area of Charette-Capulin association, gently undulating; about 16 miles west-northwest and 6 miles south of Wagon Mound; in the north half of sec. 28, T. 22 N., R. 19 E.; in the Mora Land Grant.

A1—0 to 2 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak very fine and fine granular structure; loose, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores; neutral; clear smooth boundary.

B1—2 to 12 inches; brown (7.5YR 4/2) heavy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to moderate medium and coarse granular; slightly hard, very friable, slightly sticky and plastic; many very fine, fine, and medium tubular pores; very few thin clay films on faces of peds; neutral; clear smooth boundary.

B21t—12 to 19 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, firm, sticky and plastic; few fine and common very fine roots; many very fine, fine, medium, and coarse tubular pores; common thin clay films on faces of peds and in pores; mildly alkaline; clear wavy boundary.

B22t—19 to 29 inches; brown (7.5YR 5/4) heavy clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to strong medium and coarse subangular blocky; very hard, firm, very sticky and very plastic; few fine and common very fine roots; many very fine and fine, common medium, and few coarse tubular pores; many thin clay films and few moderately thick clay films on faces of peds and in pores; mildly alkaline; clear smooth boundary.

B23t—29 to 39 inches; brown (7.5YR 5/4) heavy clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate and strong medium and coarse subangular blocky; very hard, firm, very sticky and very plastic; few fine and common very fine roots; many very fine and fine and common medium tubular pores; many thin clay films on faces of peds and in pores; trace of basalt pebbles; moderately alkaline; gradual wavy boundary.

B24t—39 to 51 inches; brown (7.5YR 5/4) heavy clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate and strong medium and coarse subangular blocky; very hard, firm, sticky and very plastic; common very fine roots; many very fine and fine and few medium tubular pores; common thin clay films on faces of peds and in pores; 5 percent basalt pebbles; moderately alkaline; gradual wavy boundary.

IIB31—51 to 60 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate and strong medium and coarse subangular blocky; very hard, firm, sticky and plastic; few very fine roots; many very fine and fine and few medium tubular pores; common thin clay films on faces of peds and in pores; 8 percent basalt pebbles and a trace of cobbles; slightly effervescent; 2 percent calcium carbonate equivalent; moderately alkaline; gradual wavy boundary.

IIB32—60 to 70 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to weak and moderate medium and coarse subangular blocky; hard, firm, sticky and plastic; few very fine roots; many very fine and fine and common medium tubular pores; 8 percent basalt pebbles and a trace of cobbles; slightly effervescent; 4 percent calcium carbonate equivalent; moderately alkaline.

The thickness of the solum ranges from 40 to 60 inches or more. Depth to lime ranges from 30 to 60 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The B1 horizon is similar in color to the A horizon. It commonly is clay loam but ranges to heavy loam and silty clay loam. The B2t horizon has hue of 10YR or

7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It commonly is clay or silty clay, but the range includes clay loam and silty clay loam. The horizon ranges from 20 to 40 inches thick. It is 0 to 10 percent basalt pebbles and cobbles. The IIB3 horizon, where present, has hue of 10YR or 7.5YR, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 3 to 5 when dry or moist. It commonly is clay loam, but the range includes loam and sandy clay loam. The horizon is 0 to 10 percent pebbles and cobbles. The lower part of this horizon is as much as 14 percent calcium carbonate.

Colmor Series

The soils in the Colmor series are classified as fine-silty, mixed, mesic Torriorthentic Haplustolls. These deep, well drained soils formed in moderately fine textured material derived mainly from shale. They are on uplands. Slope is 1 to 5 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 tc 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of Colmor loam, undulating; about 5.5 miles north of Wagon Mound, along New Mexico Highway 85, and 0.5 mile east of cemetery; in the NE1/4NW1/4 of sec. 36, T. 22 N., R. 21 E.

A11—0 to 2 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to moderate fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; few fine interstitial pores; strongly effervescent; moderately alkaline; clear smooth boundary.

A12—2 to 10 inches; dark grayish brown (10YR 4/2) loam, dark brown (10YR 3/3) moist; weak very coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and common fine roots; many medium tubular pores; strongly effervescent; moderately alkaline; clear smooth boundary.

B1—10 to 17 inches; dark grayish brown (10YR 4/2) heavy loam, dark yellowish brown (10YR 4/4) moist, weak coarse prismatic structure parting to strong medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine and medium tubular pores; violently effervescent; moderately alkaline; clear smooth boundary.

B2—17 to 32 inches; brown (10YR 5/3) silty clay loam, dark yellowish brown (10YR 4/4) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; slightly hard, friable, slightly sticky and plastic; few fine and common very fine roots; many very fine, fine, and coarse tubular pores; violently effervescent; 10 percent calcium carbonate equivalent; many thin coatings of calcium carbonate on faces of peds; moderately alkaline; clear wavy boundary.

B3ca—32 to 40 inches; pale brown (10YR 6/3) heavy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine and fine tubular pores; violently effervescent; 15 percent calcium carbonate equivalent; thin continuous coatings of calcium carbonate on faces of peds; moderately alkaline; clear irregular boundary.

C1ca—40 to 47 inches; light gray (10YR 7/2) heavy loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine and common fine tubular pores; violently effervescent; 30 percent calcium carbonate equivalent; calcium carbonate disseminated throughout; moderately alkaline; clear irregular boundary.

C2ca—47 to 60 inches; very pale brown (10YR 8/3) loam, light yellowish brown (10YR 6/4) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; many fine and medium tubular pores; 10 percent shale and sandstone pebbles; violently effervescent; 30 percent calcium carbonate equivalent; calcium carbonate disseminated throughout; moderately alkaline.

Thickness of the solum ranges from 25 to 42 inches.

The A horizon has value of 4 or 5 when dry and 2 or 3 when moist, and it has chroma of 2 or 3 when dry or moist. It is loam or silt loam.

The B2 horizon has value of 4 to 6 when dry and 4 or 5 when moist, and it has chroma of 2 to 4 when dry or moist. It is silt loam, silty clay loam, or clay loam. The B3ca horizon has value of 5 to 7 when dry and 4 to 6 when moist, and it has chroma of 2 to 4 when dry or moist. It is 10 to 15 percent calcium carbonate equivalent.

The Cca horizon has value of 6 to 8 when dry and 5 or 6 when moist, and it has chroma of 2 to 4 when dry or moist. It is loam or silt loam. The horizon is 20 to 30 percent calcium carbonate equivalent. It is 5 to 10 percent pebbles.

Crews Series

The soils in the Crews series are classified as clayey, mixed, mesic, shallow Petrocalcic Paleustolls. These shallow, well drained soils formed in mixed eolian sediment derived mainly from local sources. They are on uplands and along ridges. Slope is 0 to 5 percent. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Crews silt loam in an area of Crews-Tricon association, undulating; about 5.5 miles north of Watrous, along Interstate 25; in the northwest corner of sec. 27, T. 19 N., R. 20 E.; in the Mora Land Grant.

A1—0 to 3 inches; brown (7.5YR 5/2) silt loam, dark brown (7.5YR 3/2) moist; weak coarse subangular blocky structure parting to weak medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; neutral; clear wavy boundary.

B2t—3 to 14 inches; brown (7.5YR 5/2) heavy clay loam, dark brown (7.5YR 3/2) moist; weak coarse subangular blocky structure parting to moderate fine subangular blocky; slightly hard, friable, sticky and plastic; many very fine and fine roots; many fine tubular pores; common moderately thick clay films on faces of peds; neutral; abrupt wavy boundary.

C2cam—14 inches; white indurated caliche that is laminar and continuous.

Thickness of the solum and depth to the petrocalcic horizon range from 10 to 19 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry, and chroma of 2 or 3 when dry or moist.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is heavy clay loam to light clay.

Cundiyo Series

The soils in the Cundiyo series are classified as loamy-skeletal, mixed Typic Cryoboralfs. These deep, well drained soils formed in mixed material derived from gneiss, schist, and other metamorphic rock. They are on mountainsides. Slope is 30 to 60 percent. Elevation is 8,500 to 10,500 feet. The average annual precipitation is 22 to 28 inches, the average annual air temperature is 38 to 42 degrees F, and the frost-free period is 50 to 80 days.

Typical pedon of a Cundiyo very stony sandy loam in an area of Cundiyo-Nambe Variant association, extremely steep; along an abandoned logging road on trail to Pacheco Lake, at an elevation of 9,700 feet; in the SW1/4NW1/4 of sec. 16, T. 20 N., R. 14 E.; in the Mora Land Grant.

O—2 inches to 0; decomposing forest litter.

A1—0 to 5 inches; brown (10YR 5/3) very stony sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, very friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many fine interstitial pores; 45 percent stones and cobbles; slightly acid; abrupt smooth boundary.

A2—5 to 20 inches; pale brown (10YR 6/3) very stony sandy loam, brown (10YR 4/3) moist; very weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many fine and medium interstitial pores; 45 percent stones and cobbles; slightly acid; clear smooth boundary.

B&A—20 to 38 inches; very pale brown (10YR 7/3) very stony sandy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine and medium roots; many fine and medium tubular pores; 50 percent stones and cobbles; slightly acid; gradual wavy boundary.

B2t—38 to 45 inches; very pale brown (10YR 7/3) very stony heavy sandy loam, yellowish brown (10YR 5/4) moist; weak fine and medium subangular blocky structure; soft, friable, nonsticky and nonplastic; many fine and medium tubular pores; 60 percent stones and cobbles; slightly acid; diffuse irregular boundary.

C—45 to 60 inches; very pale brown (10YR 7/3) extremely stony sandy loam, pale brown (10YR 6/3) moist; massive; slightly hard, friable, nonsticky and nonplastic; few fine and medium roots in upper part; many fine and medium tubular pores; 70 percent stones and cobbles; slightly acid.

Depth to bedrock is more than 40 inches and typically is more than 60 inches. The control section is 50 to 90 percent rock fragments, mainly stones and cobbles.

The A horizon has value of 5 or 6 when dry and 3 or 4 when moist, and it has chroma of 2 or 3 when dry or moist.

The B&A and B2t horizons have hue of 10YR or 7.5YR, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 3 or 4 when dry or moist. They are sandy loam, loam, or heavy sandy loam and are 40 to 60 percent rock fragments.

The C horizon has hue of 10YR or 7.5YR, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 3 to 5 when dry or moist. It is sandy loam, loam, or loamy sand and is 60 to 90 percent rock fragments.

The Cundiyo soils in this survey area are taxadjuncts to the Cundiyo series because they have a B&A horizon and a dark colored surface layer. These differences, however, do not significantly affect use and management.

Dalcan Series

The soils in the Dalcan series are classified as clayey-skeletal, montmorillonitic Pachic Argiborolls. These moderately deep, well drained soils formed in residuum derived mainly from basalt. They are on basalt-capped mesas and side slopes in areas of basalt flows. Slope is 0 to 15 percent. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of a Dalcan cobbly loam in an area of Dalcan-Raton complex, undulating; about 12 miles west of Ocate, on La Mesa, and to first gate along east road to Sanchez Ranch; in sec. 15, T. 23 N., R. 16 E.; in the Mora Land Grant.

A1—0 to 4 inches; dark brown (10YR 3/3) cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many fine interstitial and vesicular pores; 34 percent basalt cobbles; neutral; clear wavy boundary.

B1t—4 to 13 inches; dark brown (7.5YR 4/3) very cobbly heavy clay loam, dark brown (7.5YR 3/2) moist; moderate medium and coarse subangular blocky structure parting to strong medium subangular blocky; slightly hard, firm, sticky and plastic; common fine roots; few fine and common medium tubular pores; common thin clay films on faces of peds and in pores; 50 to 60 percent rock fragments, mainly cobbles; neutral; clear wavy boundary.

B2t—13 to 28 inches; brown (7.5YR 5/2) very cobbly clay, dark brown (7.5YR 3/2) moist; strong medium subangular blocky structure; hard, firm, very sticky and very plastic; few coarse roots; common medium and coarse tubular pores; common thin clay films on faces of peds and in pores; 50 to 60 percent rock fragments, mainly cobbles; mildly alkaline; abrupt wavy boundary.

R—28 inches; hard basalt.

The mollic epipedon is 17 to 28 inches thick. Thickness of the solum and depth to bedrock range from 20 to 40 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or silt loam and is 25 to 35 percent rock fragments, mainly cobbles and stones.

The Bt horizon has hue of 5YR or 7.5YR, value of 3 to 5 when dry and 3 when moist, and chroma of 2 or 3 when dry or moist. It is heavy clay loam to clay and is 35 to 60 percent rock fragments, mainly cobbles and stones.

Dargol Series

The soils in the Dargol series are classified as fine, mixed Typic Eutroboralfs. These moderately deep, well drained soils formed in fine textured residuum derived mainly from shale and sandstone. They are on mountainsides and mesas and along ridges. Slope is 5 to 45 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 24 inches, the average annual air temperature is 38 to 46 degrees F, and the frost-free period is 85 to 110 days.

Typical pedon of a Dargol stony loam in an area of Dargol-Rocio-Vamer association, hilly; about 2.25 miles east of South Carmen, along Rito Cebolla and New Mexico Highway 3; in the NW1/4 of sec. 13, T. 19 N., R. 15 E.; in the Mora Land Grant.

O—1 inch to 0; forest litter.

A21—0 to 4 inches; grayish brown (10YR 5/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine interstitial pores; 15 percent stones; slightly acid; clear smooth boundary.

A22—4 to 12 inches; brown (10YR 5/3) stony loam, dark brown (10YR 4/3) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine interstitial pores; 10 percent stones and 10 percent pebbles; slightly acid; clear wavy boundary.

B2t—12 to 27 inches; light brown (7.5YR 6/4) clay, strong brown (7.5YR 5/6) moist; moderate coarse prismatic structure parting to strong fine and medium angular blocky; hard, firm, very sticky and very plastic; common fine, medium, and coarse roots; many very fine and fine tubular pores; many thin clay films on faces of peds; 5 percent pebbles; medium acid; abrupt wavy boundary.

R—27 inches; hard reddish brown sandstone underlain by interbedded shale.

Depth to bedrock ranges from 20 to 40 inches. Some pedons have a thin Al or C horizon.

The A2 horizon has value of 4 to 6 when dry and 3 to 5 when moist, and it has chroma of 2 to 4 when dry or moist. Content of rock fragments ranges from 15 to 25 percent.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 4 or 5 when moist, and chroma of 4 to 6 when dry or moist. It commonly is clay, but the range includes silty clay.

Etoe Series

The soils in the Etoe series are classified as loamy-skeletal, mixed Typic Paleboralfs. These deep, well drained soils formed in alluvial and colluvial material derived mainly from sandstone and shale. They are on mountainsides and benches. Slope is 5 to 70 percent. Elevation is 8,000 to 11,000 feet. The average annual precipitation is 18 to 26 inches, the average annual air temperature is 38 to 44 degrees F, and the frost-free period is less than 90 days.

Typical pedon of an Etoe cobbly fine sandy loam in an area of Etoe-Rock outcrop-Rubble land complex, extremely steep; about 3 miles upstream from junction of Coyote Creek and Little Blue Creek, near the top of slope on north side; in the north half of sec. 8, T. 23 N., R. 16 E.; in the Mora Land Grant.

O—2 inches to 0; undecomposed and decomposed forest litter.

A21—0 to 2 inches; light brownish gray (10YR 6/2) cobbly fine sandy loam, very dark grayish brown (10YR 3/2) moist; very weak fine granular structure; soft, friable, nonsticky and slightly plastic; many fine roots and few medium and coarse roots; many fine interstitial pores; few dark organic spots; 20 percent cobbles; medium acid; clear smooth boundary.

A22—2 to 12 inches; pale brown (10YR 6/3) cobbly loam, brown (10YR 4/3) moist; very weak fine granular structure; soft, friable, nonsticky and slightly plastic; many fine, medium, and coarse roots; many fine interstitial pores; 20 percent cobbles; medium acid; clear wavy boundary.

A&B—12 to 24 inches; pale brown (10YR 6/3) cobbly fine sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many fine tubular pores; few pockets of B21t material in lower part; 25 percent cobbles; medium acid; gradual wavy boundary.

B21t—24 to 28 inches; yellowish brown (10YR 5/4) very cobbly loam, dark yellowish brown (10YR 4/4) moist; weak medium subangular blocky structure parting to moderate fine and medium granular; hard, friable, sticky and plastic; common fine and coarse roots; common fine tubular pores; common moderately thick clay films on faces of peds; 60 percent cobbles; slightly acid; clear wavy boundary.

B22t—28 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly loam, dark yellowish brown (10YR 4/4) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and plastic; many fine roots in upper part; many fine tubular pores; common moderately thick clay films on faces of peds; 70 percent cobbles; slightly acid.

The solum is more than 60 inches thick. Depth to the argillic horizon ranges from 24 to 35 inches. Some pedons have a thin B&A or A1 horizon.

The A2 horizon has hue of 10YR or 7.5YR, value of 5 to 7 when dry and 3 to 5 when moist, and chroma of 2 or 3 when dry or moist. It is loam, sandy loam, or fine sandy loam and is 15 to 35 percent rock fragments, mainly cobbles and stones.

The A&B horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 6 when dry or moist. It is loam, sandy loam, or fine sandy loam and is 20 to 60 percent rock fragments, mainly cobbles.

The B2t horizon has hue of 10YR or 7.5YR, value of 3 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 6 when dry or moist. It is loam, sandy loam, or sandy clay loam and is 50 to 85 percent rock fragments, mainly cobbles.

Etown Series

The soils in the Etown series are classified as clayey-skeletal, mixed Typic Eutroboralfs. These deep, well drained soils formed in alluvial and colluvial material derived mainly from sandstone and shale. They are on mountainsides. Slope is 35 to 55 percent. Elevation is 9,000 to 11,000 feet. The average annual precipitation is 18 to 24 inches, the average annual air temperature is 38 to 44 degrees F, and the frost-free period is less than 90 days.

Typical pedon of an Etown gravelly loam in an area of Etoe-Etown association, very steep; about 3 miles west of Coyote Creek, along Little Blue Creek; in the south half of sec. 5, T. 23 N., R. 16 E.; in the Mora Land Grant.

O—3 inches to 0; decomposing and decomposed forest litter.

A1—0 to 3 inches; dark grayish brown (7.5YR 4/2) gravelly loam, very dark brown (7.5YR 2/2) moist; moderate fine granular structure; soft, friable, nonsticky and slightly plastic; many very fine and fine roots; common fine interstitial pores; 10 percent cobbles and 20 percent pebbles; medium acid; clear wavy boundary.

A2—3 to 11 inches; pinkish gray (7.5YR 6/2) very gravelly loam, brown (7.5YR 4/2) moist; weak fine, medium, and coarse granular structure; soft, friable, nonsticky and slightly plastic; many fine and medium roots; many fine interstitial pores; 50 percent pebbles and 5 percent cobbles; medium acid; clear wavy boundary.

B&A—11 to 15 inches; 75 percent light brown (7.5YR 6/4) very gravelly clay loam, brown (7.5YR 4/4) moist; 25 percent light brownish gray (7.5YR 6/2) very gravelly clay loam, brown (7.5YR 5/2) when moist; strong medium subangular blocky structure; hard, firm, slightly sticky and plastic; many fine and medium roots; few fine tubular pores; common moderately thick clay films on faces of peds of B material; 35 percent pebbles and 10 percent cobbles; medium acid; gradual wavy boundary.

B21t—15 to 29 inches; reddish yellow (7.5YR 6/6) extremely gravelly clay, reddish yellow (7.5YR 6/6) moist; strong medium subangular blocky structure; very hard, firm, sticky and plastic; many fine and medium roots; few fine tubular pores; common moderately thick clay films on faces of peds and rock fragments; 50 percent pebbles and 20 percent cobbles; slightly acid; clear wavy boundary.

B22t—29 to 60 inches; reddish yellow (7.5YR 6/6) extremely gravelly clay, reddish yellow (7.5YR 6/6) moist; moderate medium subangular blocky structure; very hard, firm, sticky and very plastic; few fine and medium roots; few very fine tubular pores; common moderately thick clay films on faces of peds and rock fragments; 50 percent pebbles and 20 percent cobbles; slightly acid.

The argillic horizon is at a depth of 10 to 24 inches. Some pedons do not have an A1 horizon.

The A2 horizon has value of 6 or 7 when dry 4 to 6 when moist, and it has chroma of 2 or 3 when dry or moist. It is 30 to 50 percent pebbles and 5 to 10 percent cobbles.

The B&A horizon has value of 6 or 7 when dry and 4 to 6 when moist, and it has chroma of 2 to 4 when dry or moist. It is 25 to 40 percent pebbles and 5 to 15 percent cobbles.

The B2t horizon has value of 5 or 6 when dry and 4 to 6 when moist, and it has chroma of 3 to 6 when dry or moist. It commonly is clay, but the range includes silty clay and heavy clay loam. The horizon is 45 to 70 percent pebbles.

Eutroboralfs

Eutroboralfs are extremely variable in their characteristics. They are shallow to deep, well drained soils that formed in mixed material derived mainly from sandstone and shale. These soils are on mountainsides, foothills, and benches. Slope is 8 to 65 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 22 inches, the average annual air temperature is 40 to 44 degrees F, and the frost-free period is 85 to 110 days.

Sample pedon of Eutroboralfs in an area of Eutroboralfs-Rock outcrop-Vamer complex, extremely steep; about halfway up the north side of Vigil Canyon, 3 miles from junction of New Mexico Highway 3 and Vigil Canyon Road; in the NW1/4 of sec. 13, T. 21 N., R. 14 E.; in the Mora Land Grant.

O—1 inch to 0; decomposing branches, twigs, leaves, and grass.

A2—0 to 14 inches; reddish brown (5YR 5/3) very stony loam, reddish brown (5YR 4/3) moist; moderate medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine interstitial pores; 15 percent stones, 15 percent cobbles, and 15 percent pebbles; slightly acid; clear smooth boundary.

B&A—14 to 24 inches; reddish brown (5YR 5/4) very cobbly clay loam, reddish brown (5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, firm, sticky and plastic; many fine, medium, and coarse roots; many fine and medium interstitial pores; common coatings of A2 material and very few thin clay films on faces of peds; 40 percent cobbles, 15 percent pebbles, and 10 percent stones; slightly acid; clear wavy boundary.

B2t—24 to 43 inches; brown (7.5YR 5/4) very cobbly clay, brown (7.5YR 4/4) moist; strong medium and coarse subangular blocky structure; hard, very firm, very sticky and very plastic; common fine, medium, and coarse roots; many very fine and fine tubular pores; common thin clay films on faces of peds; 20 percent cobbles, 20 percent pebbles, and trace of stones; slightly acid; gradual wavy boundary.

B3t—43 to 60 inches; 60 percent brown (7.5YR 5/4) and 40 percent yellowish brown (10YR 5/4) very cobbly clay, dark brown (7.5YR 4/4) and dark yellowish brown (10YR 4/4) moist; strong coarse subangular blocky structure; hard, very firm, very sticky and very plastic; common fine, medium, and coarse roots in upper part; many very fine and fine tubular pores; common thin clay films on faces of peds; 20 percent cobbles, 20 percent pebbles, and trace of stones; slightly acid; diffuse boundary.

IIC1—60 to 80 inches; light brown (7.5YR 6/4) extremely stony clay, brown (7.5YR 5/4) moist; massive; 90 to 95 percent rock fragments, mainly stones and cobbles.

Depth to bedrock ranges from 19 to 60 inches or more. Most pedons have a B&A horizon that is 4 to 10 inches thick.

The A2 horizon has hue of 2.5YR, 5YR, 7.5YR, or 10YR, value of 4 to 7 when dry and 3 to 6 when moist, and chroma of 2 to 4 when dry or moist.

The Bt horizon has hue of 2.5YR, 5YR, 7.5YR, or 10YR, value of 3 to 7 when dry and 3 to 6 when moist, and chroma of 3 to 6 when dry or moist. It ranges from loam or clay loam to clay and is 5 to 95 percent rock fragments.

Firo Series

The soils in the Firo series are classified as loamy-skeletal, mixed Lithic Haploborolls. These shallow, well drained soils formed in mixed material derived mainly from metamorphic rock. They are on mountainsides. Slope is 5 to 55 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degress F, and the frost-free period is 90 to 110 days.

Typical pedon of a Firo very stony loam in an area of Firo-Rock outcrop complex, extremely steep; 3 miles along Comanche Canyon from Mora River, on an east-northeast-facing side slope about 1 mile from Mountain road; in the southwest corner of sec. 34, T. 21 N., R. 15 E.; in the Mora Land Grant.

O—2 inches to 0; decomposing leaves, needles, and woody twigs.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) very stony loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; slightly hard, very friable, sticky and plastic; many fine, medium, and coarse roots; many very fine interstitial pores; 15 percent stones, 20 percent cobbles, and 15 percent pebbles; slightly acid; clear smooth boundary.

B2—3 to 11 inches; dark grayish brown (10YR 4/2) very cobbly clay loam, very dark brown (10YR 2/2) moist; moderate medium subangular blocky structure parting to strong fine and medium granular; hard, friable, sticky and plastic; many fine, medium, and coarse roots; many very fine and fine tubular pores; 5 percent stones, 20 percent cobbles, and 15 percent pebbles; neutral; abrupt wavy boundary.

R—11 inches; hard metamorphosed sandstone and other metamorphic rock.

Depth to metamorphic bedrock ranges from 7 to 20 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or sandy loam and is 30 to 60 percent rock fragments.

The B2 horizon is similar in color to the A horizon. The B2 horizon is clay loam or loam and is 35 to 65 percent rock fragments.

Some pedons have a thin C horizon.

Fuera Series

The soils in the Fuera series are classified as fine, mixed Typic Eutroboralfs. These deep, well drained soils formed in colluvial and alluvial material derived mainly from sandstone and shale. They are on convex mountainsides. Slope is 5 to 55 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 19 inches, the average annual air temperature is 38 to 46 degrees F, and the frost-free period is 85 to 110 days.

Typical pedon of a Fuera cobbly loam in an area of Fuera-Dargol association, very steep; in the Rincon Mountains, about 5 miles up El Canyon de Caro from New Mexico Highway 38; in the NW1/4 of sec. 26, T. 22 N., R. 15 E.; in the Mora Land Grant.

O—1 inch to 0; forest litter.

A21—0 to 3 inches; dark grayish brown (10YR 4/2) cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine interstitial pores; 15 percent pebbles and 15 percent cobbles; slightly acid; clear smooth boundary.

A22—3 to 14 inches; light brown (7.5YR 6/4) cobbly fine sandy loam, brown (7.5YR 4/4) moist; weak medium subangular blocky structure parting to moderate medium granular; slightly hard, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine interstitial pores; 24 percent cobbles and 10 percent pebbles; slightly acid; clear wavy boundary.

B&A—14 to 20 inches; light brown (7.5YR 6/4) cobbly light clay, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; hard, firm, very sticky and very plastic; many fine, medium, and coarse roots; many very fine and fine tubular pores; very few thin clay films on faces of peds of B2t material; 20 percent cobbles and 10 percent pebbles; neutral; gradual wavy boundary.

B22t—20 to 27 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; strong medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; many fine, medium, and coarse roots; common very fine tubular pores; many thin clay films on faces of peds; 10 percent pebbles and cobbles; neutral; gradual wavy boundary.

B23t—27 to 39 inches; brown (10YR 5/3) cobbly clay, dark brown (10YR 4/3) moist; moderate medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; common fine roots; common very fine tubular pores; thin clay films on faces of peds; 15 percent pebbles and 10 percent cobbles; neutral; diffuse irregular boundary.

B24t—39 to 60 inches; brown (10YR 5/3) very cobbly clay, dark brown (10YR 4/3) moist; few medium distinct mottles that are strong brown (7.5YR 5/6) when dry or moist; weak medium and coarse subangular blocky structure and massive in parts; hard, firm, very sticky and very plastic; few very fine roots in upper part; few very fine tubular pores; few thin clay films on faces of peds; 30 percent pebbles and 30 percent cobbles; neutral in upper part and mildly alkaline in lower part.

The solum is 30 to 60 inches thick. Rock fragment content ranges from 15 to 34 percent in the A2 horizon, 5 to 15 percent in the upper part of the B2t horizon, and 25 to 60 percent in the lower part of the B2t horizon. Some pedons have a C horizon.

The A2 horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist.

The B2t horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 to 5 when dry or moist. The fine earth fraction commonly is clay and is more than 45 percent clay.

Haplustolls

Haplustolls are extremely variable in their characteristics. They are shallow to deep, well drained soils that formed in mixed material derived mainly from sandstone and shale. These soils are on benches and side slopes in deeply cut sandstone canyons. Slope is 40 to 65 percent. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Sample pedon of Haplustolls in an area of Haplustolls-Rock outcrop complex, extremely steep; about 22 miles east of Wagon Mound, along New Mexico Highway 120, near the junction of New Mexico Highway 120 and the Canadian River; 200 feet upslope from old bridge abutment on south side of the Canadian River; in the SW1/4 of sec. 35, T. 20 N., R. 24 E.

A1—0 to 4 inches; brown (10YR 4/3) very stony sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; loose, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine interstitial pores; 15 percent stones, 20 percent cobbles, and 20 percent pebbles; strongly effervescent; moderately alkaline; abrupt smooth boundary.

A11b—4 to 10 inches; dark grayish brown (10YR 4/2) very cobbly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; loose, very friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; 30 percent cobbles, 20 percent pebbles, and 5 percent stones; strongly effervescent; moderately alkaline; clear smooth boundary.

A12b—10 to 20 inches; grayish brown (10YR 5/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; loose, friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; 35 percent cobbles, 20 percent pebbles, and 5 percent stones; violently effervescent; moderately alkaline; gradual wavy boundary.

C—20 to 60 inches; brown (10YR 5/3) extremely cobbly sandy clay loam with common thin strata of sandy loam and loam, dark yellowish brown (10YR 3/4) moist; massive; loose, friable, slightly sticky and slightly plastic; few fine roots in upper part; many fine and medium tubular pores; 60 percent cobbles, 20 percent pebbles, and 5 percent stones; violently effervescent; moderately alkaline.

The profile is 10 to 90 percent rock fragments and 0 to 14 percent carbonates throughout. Depth to bedrock is 10 to 60 inches or more. The mollic epipedon is 10 to 20 inches thick. A IIA1 horizon consisting of recent colluvial deposits is in some pedons.

The A horizon has hue of 2.5YR to 5Y, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The C horizon has hue of 2.5YR to 5Y, value of 3 to 7 when dry and 2 to 6 when moist, and chroma of 2 to 8 when dry or moist. The fine earth fraction ranges from loamy sand to clay. This horizon generally is stratified.

Hesperus Series

The soils in the Hesperus series are classified as fine-loamy, mixed Pachic Argiborolls. These deep, well drained soils formed in alluvial sediment derived mainly from metamorphic and sedimentary rocks. They are on lower lying alluvial mountainsides and valleys. Slope is 1 to 15 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the frost-free season is 90 to 110 days.

Typical pedon of Hesperus sandy loam, 1 to 3 percent slopes; 1.5 miles north-northeast of Mora, along New Mexico Highway 38; in the SW1/4 of sec. 2, T. 20 N., R. 15 E.; at the county landfill site; in the Mora Land Grant.

A1—0 to 12 inches; brown (7.5YR 5/3) sandy loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; loose, soft, nonsticky and nonplastic; many very fine and fine roots; many fine interstitial pores; few fine mica flakes; neutral; clear smooth boundary.

B1—12 to 22 inches; brown (7.5YR 4/2) light clay loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; very friable, hard, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; few fine mica flakes; neutral; clear smooth boundary.

B21t—22 to 33 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; very friable, hard, sticky and plastic; many very fine and fine roots; common fine tubular pores; few thin clay films on faces of peds; few fine mica flakes; neutral; clear smooth boundary.

B22t—33 to 44 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots; common fine tubular pores; common thin clay films and few moderately thick clay films on faces of peds; few fine mica flakes; neutral; clear wavy boundary.

C—44 to 64 inches; light brown (7.5YR 6/4) sandy clay loam, brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine roots; few fine tubular pores; common fine mica flakes; neutral.

Thickness of the mollic epipedon and depth to the lower limit of the argillic horizon range from 18 to 50 inches. Most pedons have few or common fine mica flakes throughout.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is loam, sandy clay loam, or clay loam.

The C horizon has hue of 10YR or 7.5YR.

Hillery Series

The soils in the Hillery series are classified as fine, montmorillonitic Pachic Argiborolls. These deep, well drained soils formed in fine textured residuum derived mainly from basalt. They are on mesas. Slope is 5 to 15 percent. Elevation is 8,200 to 11,000 feet. The average annual precipitation is 18 to 22 inches, the average annual air temperature is 40 to 44 degrees F, and the frost-free period is less than 90 days.

Typical pedon of a Hillery stony loam in an area of Burnac-Hillery association, hilly; about 4 miles northwest of Ocate; 150 feet south of Ten High Ranch Road, on the top of Ocate Mesa, and 1.5 miles from junction of New Mexico Highway 120; in the east half of sec. 6, T. 23 N., R. 17 E.; in the Mora Land Grant.

A1—0 to 8 inches; dark brown (7.5YR 4/2) stony loam, dark brown (7.5YR 3/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium and coarse roots; common medium vesicular pores; 20 percent basalt fragments, mainly stones; neutral; clear smooth boundary.

B1—8 to 14 inches; reddish brown (5YR 4/3) cobbly clay loam, dark reddish brown (5YR 3/3) moist; moderate medium and coarse granular structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common fine and medium tubular pores; 20 percent rock fragments, mainly cobbles; neutral; clear wavy boundary.

B21t—14 to 21 inches; reddish brown (5YR 5/3) cobbly silty clay, dark reddish brown (5YR 3/3) moist; weak coarse prismatic structure parting to strong medium angular blocky; hard, firm, sticky and plastic; common very fine and fine roots; few fine tubular pores; common thin clay films on faces of peds; 20 percent basalt cobbles and pebbles; neutral; clear wavy boundary.

B22t—21 to 31 inches; brown (7.5YR 5/4) cobbly silty clay, dark brown (7.5YR 4/4) moist; weak coarse prismatic structure parting to moderate medium angular blocky; very hard, firm, sticky and plastic; few fine roots; few fine tubular pores; common thin clay films on faces of peds; 10 percent cobbles and 10 percent pebbles; neutral; clear wavy boundary.

B23t—31 to 40 inches; reddish brown (5YR 5/4) cobbly silty clay, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure; very hard, firm, sticky and plastic; few fine tubular pores; 10 percent cobbles and 10 percent pebbles; neutral; gradual wavy boundary.

C—40 to 60 inches; reddish brown (5YR 4/4) cobbly silty clay, yellowish red (5YR 4/6) moist; massive; very hard, firm, sticky and plastic; few fine tubular pores; 10 percent cobbles and 10 percent pebbles; neutral.

The solum is 40 to 60 inches thick. The control section is 5 to 30 percent rock fragments. The mollic epipedon is 16 to 22 inches thick.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 1 to 3 when dry or moist.

The B2t horizon has hue of 5YR to 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is cobbly clay or cobbly silty clay.

The C horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry or moist, and chroma of 2 to 6 when dry or moist.

Holman Series

The soils in the Holman series are classified as sandy-skeletal, mixed Entic Haploborolls. These deep, excessively drained soils formed in coarse textured material derived from various kinds of rock. They are on flood plains and bench terraces along major drainageways in mountain valleys. Slope is 3 to 5 percent. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of a Holman very cobbly sandy loam in an area of Holman complex, 3 to 5 percent slopes, along fence line about 0.25 mile west and 250 feet south of junction of New Mexico Highway 3 and Rio La Casa; in the SW1/4 of sec. 5, T. 20 N., R. 15 E.; in the Mora Land Grant.

A11—0 to 10 inches; very dark grayish brown (10YR 3/2) very cobbly sandy loam, very dark brown (10YR 2/2) moist; weak medium subangular blocky structure parting to weak fine and medium granular; loose, very friable, slightly sticky and slightly plastic; many fine and medium tubular pores; 40 percent cobbles and 5 percent pebbles; neutral; clear smooth boundary.

A12—10 to 14 inches; brown (10YR 4/3) very cobbly loamy sand, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; loose, very friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; common fine and medium tubular pores; 50 percent cobbles and 10 percent pebbles; neutral; clear wavy boundary.

C1—14 to 24 inches; yellowish brown (10YR 5/4) extremely cobbly sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots; 60 percent cobbles and 20 percent pebbles; neutral; diffuse broken boundary.

C2—24 to 60 inches; yellowish brown (10YR 5/4) extremely cobbly coarse sand, dark yellowish brown (10YR 4/4) moist; single grain; loose, nonsticky and nonplastic; common very fine and fine roots in upper part; 70 percent cobbles and 20 percent pebbles; mildly alkaline.

The mollic epipedon is 10 to 15 inches thick. Some pedons have a layer of recently deposited sediment 1 inch to 2 inches thick on the surface.

The A horizon has hue of 10YR or 7.5YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is 35 to 75 percent cobbles and 5 to 25 percent pebbles. The horizon is very cobbly sandy loam or extremely cobbly sandy loam.

The C horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 3 or 4 when dry or moist. It is 50 to 80 percent cobbles and 10 to 25 percent pebbles.

Karde Series

The soils in the Karde series are classified as fine-silty, carbonatic, mesic Ustic Torriorthents. These deep, well drained soils formed in eolian sediment. They are principally on the leeward side of potholes and dry lakebeds. Slope is 2 to 8 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Karde fine sandy loam in an area of Vermejo-Karde association, gently sloping; about 3 miles northeast of Wagon Mound; in the NW1/4 of sec. 13, T. 21 N., R. 22 E.

A1—0 to 3 inches; brown (10YR 5/3) fine sandy loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; loose, very friable, nonsticky and nonplastic; many very fine and fine roots; violently effervescent; 15 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

AC—3 to 13 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; violently effervescent; 15 to 20 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

C1—13 to 24 inches; light brownish gray (10YR 6/2) silt loam, brown (10YR 5/3) moist; massive; soft, friable, slightly sticky and slightly plastic; common very fine and fine roots; violently effervescent; 40 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

C2—24 to 60 inches; very pale brown (10YR 7/3) heavy silt loam, light yellowish brown (10YR 6/4) moist; massive; soft, friable, slightly sticky and slightly plastic; violently effervescent; 45 percent calcium carbonate equivalent; moderately alkaline.

The control section averages more than 40 percent calcium carbonate equivalent. The profile is nonsaline or slightly saline.

The A and AC horizons have hue of 10YR or 2.5Y, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4 when dry or moist.

The C horizon has hue of 10YR to 5Y, value of 6 or 7 when dry and 5 or 6 when moist, and chroma of 2 to 4 when dry or moist. It is loam, silt loam, or clay loam.

Kinesava Series

The soils in the Kinesava series are classified as fine, mixed Pachic Paleborolls. These deep, well drained soils formed in alluvial sediment derived from various kinds of rock. They are in alluvial mountain valleys. Slope is 1 to 8 percent. Elevation is 7,200 to 8,500 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of Kinesava sandy loam, 3 to 8 percent slopes; about 2.5 miles northeast of Mora, along New Mexico Highway 38; in the SE1/4 of sec. 16, T. 21 N., R. 16 E.; in the Mora Land Grant.

A11—0 to 12 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 3/2) moist; single grain; loose, soft, nonsticky and nonplastic; many very fine and fine roots; many fine interstitial pores; few fine mica flakes; mildly alkaline; clear smooth boundary.

A12—12 to 21 inches; dark grayish brown (10YR 4/2) sandy loam, very dark grayish brown (10YR 2/2) moist; weak fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; few fine mica flakes; mildly alkaline; clear smooth boundary.

B1—21 to 34 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 2/2) moist; moderate very coarse prismatic structure parting to strong medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots; many fine tubular pores; few fine mica flakes; mildly alkaline; clear smooth boundary.

B21t—34 to 42 inches; light reddish brown (5YR 6/4) heavy clay loam, reddish brown (5YR 5/4) moist; moderate medium prismatic structure parting to strong medium subangular blocky; hard, friable, sticky and plastic; common very fine and fine roots; many medium tubular pores; many moderately thick clay films on faces of peds and in pores; few fine mica flakes; mildly alkaline; clear smooth boundary.

B22t—42 to 53 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; moderate very coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, very sticky and very plastic; common fine tubular pores; many moderately thick clay films on faces of peds; few fine mica flakes; mildly alkaline; clear smooth boundary.

B3—53 to 63 inches; reddish brown (5YR 5/4) heavy clay loam, reddish brown (5YR 4/4) moist; strong medium subangular blocky structure; very hard, firm, sticky and plastic; few fine roots; many fine tubular pores; few thin clay films on faces of peds; common fine mica flakes; mildly alkaline; gradual wavy boundary.

C—63 to 75 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; massive; very hard, firm, sticky and plastic; few fine tubular pores; common fine mica flakes; mildly alkaline.

The mollic epipedon is 34 to 51 inches thick. The argillic horizon is at a depth of 25 to 38 inches.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or sandy loam.

The B2t horizon has hue of 5YR to 10YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 8 when dry or moist. It is clay or heavy clay loam.

The Kinesava soils in this survey area are taxadjuncts to the Kinesava series because they have hue of 10YR. This difference, however, does not significantly affect use and management.

Krakon Series

The soils in the Krakon series are classified as loamy, mixed, nonacid, frigid, shallow Typic Ustorthents. These shallow, well drained soils formed in material derived mainly from shale. They are on convex mountainsides and foothills. Slope is 5 to 25 percent. Elevation is 7,500 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 46 degrees F, and the frost-free period is 85 to 110 days.

Typical pedon of a Krakon clay loam in an area of Krakon-Rock outcrop complex, hilly; about 1.9 miles up Alamitos Canyon from New Mexico Highway 121; in the southwest corner of the NW1/4 of sec. 30, T. 22 N., R. 15 E.; in the Mora Land Grant.

A1—0 to 6 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; strong fine granular structure; slightly hard, friable, slightly sticky and plastic; many fine and medium roots; many fine interstitial pores; 3 percent channery fragments; mildly alkaline; clear wavy boundary.

AC—6 to 14 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate and strong medium and coarse granular structure; slightly hard, friable, sticky and plastic; many fine, medium, and coarse roots; many fine interstitial pores; 5 percent channery fragments; neutral; abrupt wavy boundary.

Cr1—14 to 17 inches; black and dark grayish brown clayey shale.

Cr2—17 to 60 inches; black and dark grayish brown shale that has thin strata of mudstone and limestone.

Depth to the paralithic contact ranges from 8 to 20 inches. Rock fragments in the profile are shale, limestone, and sandstone and are mainly less than 3 inches in diameter.

Some pedons have a thin C horizon, and some are effervescent throughout.

The A horizon commonly has hue of 10YR, but it has hue of 2.5Y in some pedons. The horizon has value of 3 or 4 when dry and 2 or 3 when moist, and it has chroma of 1 or 2 when dry or moist. The horizon is 0 to 14 percent channery fragments.

The AC horizon commonly has hue of 10YR, but it has hue of 2.5Y in some pedons. The horizon has value of 3 to 5 when dry and 2 to 4 when moist, and it has chroma of 1 to 3 when dry or moist. The horizon is 5 to 30 percent channery fragments.

La Brier Series

The soils in the La Brier series are classified as fine, mixed, mesic Torrertic Argiustolls. These deep, well drained soils formed in alluvium derived mainly from sandstone and basalt. They are on concave valley sides, on flood plains, and in swales. Slope is 0 to 3 percent. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of La Brier silty clay loam, 0 to 3 percent slopes; about 0.25 mile north of True Farms headquarters; in sec. 8, T. 18 N., R. 20 E.; in the Mora Land Grant.

A1—0 to 6 inches; brown (7.5YR 5/2) silty clay loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to moderate coarse granular; slightly hard, very friable, slightly sticky and slightly plastic; many fine roots; many fine tubular pores; moderately alkaline; clear wavy boundary.

B21t—6 to 18 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 3/2) moist; weak medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; common fine roots; many very fine tubular pores; few very thin clay films on faces of peds; moderately alkaline; clear wavy boundary.

B22t—18 to 36 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 3/2) moist; weak coarse subangular blocky structure; very hard, very firm, sticky and plastic; few fine roots; common very fine tubular pores; common thin clay films on faces of peds; moderately alkaline; clear smooth boundary.

B3ca—36 to 50 inches; pinkish gray (7.5YR 7/2) clay loam, brown (7.5YR 5/2) moist; weak coarse subangular blocky structure; very hard, firm, slightly sticky and slightly plastic; few fine roots; common fine tubular pores; violently effervescent; disseminated lime throughout; 10 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

Cca—50 to 60 inches; pinkish gray (7.5YR 7/2) clay loam, brown (7.5YR 5/2) moist; massive; very hard, firm, slightly sticky and slightly plastic; violently effervescent; lime segregated in few fine filaments and soft nodules; less than 10 percent calcium carbonate equivalent; moderately alkaline.

The solum is 31 to 60 inches thick or more. Bedrock is at a depth of more than 60 inches.

The A horizon has hue of 7.5YR or 10YR, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 1 to 3 when dry or moist.

The Bt horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 to 4 when moist, and chroma of 2 or 3 when dry or moist. The horizon is silty clay or clay. It typically is slightly effervescent to strongly effervescent in the lower part. The B3 horizon has hue of 7.5YR or 10YR, value of 5 to 7 when dry and 4 to 6 when moist, and chroma of 2 to 4 when dry or moist. It is clay loam, silty clay loam, or silty clay.

The C horizon has hue of 7.5YR or 10YR, and it has chroma of 3 or less to a depth of 60 inches or more. It is clay loam or silty clay loam.

Lavate Variant

The soils in the Lavate Variant are classified as fine-loamy, mixed, mesic Aridic Argiustolls. These deep, well drained soils formed in mixed alluvial sediment derived mainly from sedimentary rock. They are on valley sides and on slightly convex side slopes in the Rainsville area. Slope is 1 to 5 percent. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Lavate Variant loam in an area of Remunda-Lavate Variant association, gently sloping; in a large pit on the north side of Rainsville Road, about 1.25 miles north and 0.25 mile east of La Cueva; in the south half of sec. 15, T. 20 N., R. 16 E.; in the Mora Land Grant.

A1—0 to 3 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak fine platy structure and weak fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; moderately alkaline; clear smooth boundary.

B1—3 to 10 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; moderate coarse subangular blocky structure parting to strong medium subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine and fine tubular pores; moderately alkaline; clear smooth boundary.

B21t—10 to 22 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate coarse prismatic structure parting to strong medium prismatic; very hard, firm, sticky and plastic; common very fine and fine roots; many fine and medium tubular pores and few coarse tubular pores; moderately alkaline; clear wavy boundary.

B22t—22 to 43 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; strong coarse prismatic structure parting to strong medium and coarse angular blocky; very hard, firm, sticky and plastic; common very fine and fine roots; many fine and medium tubular pores; many moderately thick clay films on faces of peds and in pores; 5 percent pebbles; moderately alkaline; clear wavy boundary.

B3—43 to 60 inches; reddish brown (5YR 5/4) sandy clay loam, reddish brown (5YR 4/4) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, friable, sticky and plastic; few very fine and fine roots; many very fine and fine tubular pores; few very thin clay films on faces of peds; 5 percent pebbles; moderately alkaline.

The mollic epipedon is 10 to 14 inches thick. The solum is 25 to 60 inches thick. Some pedons have carbonates below a depth of 50 inches.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The B horizon has hue of 7.5YR or 5YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is loam, sandy clay loam, or clay loam. The horizon is 28 to 34 percent clay.

Some pedons have a C horizon. The B and C horizons are 0 to 5 percent pebbles.

Litle Series

The soils in the Litle series are classified as fine, mixed, mesic Ustollic Camborthids. These moderately deep, well drained soils formed in residuum derived mainly from shale. They are on the lower lying upland hillsides and ridges. Slope is 3 to 9 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Litle clay loam in an area of Litle-Mion association, moderately sloping; about 15 miles southeast of Wagon Mound, along New Mexico Highway 271; in the south half of the NW1/4 of sec. 27, T. 19 N., R. 23 E.

A1—0 to 6 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak very fine granular structure; soft, very friable, sticky and plastic; many very fine and fine roots; strongly effervescent; 5 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

B2—6 to 17 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak coarse prismatic structure parting to moderate medium angular blocky; hard, firm, very sticky and very plastic; many very fine and fine roots; common very fine tubular pores; strongly effervescent; 8 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

B3—17 to 25 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; strongly effervescent; 8 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

C1—25 to 36 inches; grayish brown (10YR 5/2) silty clay, dark grayish brown (10YR 4/2) moist; weak coarse angular blocky structure in the upper part and massive in the lower part; very hard, firm, sticky and very plastic; few very fine roots; common very fine tubular pores; violently effervescent; 10 percent calcium carbonate equivalent; moderately alkaline; abrupt wavy boundary.

Cr—36 to 60 inches; grayish brown and pale brown, calcareous shale; few roots in upper 2 to 4 inches.

The depth to shale is 20 to 40 inches. The control section is 35 to 55 percent clay. The profile is nonsaline or slightly saline.

The A horizon has hue of 2.5Y or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist.

The B horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4 when dry or moist. It is silty clay loam to clay.

The C horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 2 to 4 when dry or moist. Some pedons have gypsum crystals in the lower part of the C horizon.

Maes Series

The soils in the Maes series are classified as clayey-skeletal, mixed Eutric Glossoboralfs. These deep, well drained soils formed in material derived mainly from sandstone and shale. They are on mountainsides and benches. Slope is 5 to 70 percent. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 18 to 26 inches, the average annual air temperature is 38 to 44 degrees F, and the frost-free period is less than 90 days.

Typical pedon of a Maes very cobbly loam in an area of Maes-Etoe complex, extremely steep; about 2 miles west of Rio la Casa Ranch headquarters and halfway up the north side of Middle Fork Rio la Casa, at an elevation of 9,400 feet; in the NE1/4 of sec. 5, T. 20 N., R. 14 E.; in the Mora Land Grant.

O—2 inches to 0; decomposing forest litter.

A1—0 to 1 inch; dark grayish brown (10YR 4/2) very cobbly loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; 40 percent cobbles and pebbles; neutral; abrupt smooth boundary.

A2—I inch to 17 inches; light yellowish brown (10YR 6/4) very cobbly sandy loam, brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots, many fine and medium tubular pores; 50 percent cobbles and pebbles; neutral; clear wavy boundary.

B&A—17 to 24 inches; pale brown (10YR 6/3) very cobbly heavy loam, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine and medium tubular pores; 50 percent cobbles and pebbles; slightly acid; gradual wavy boundary.

B21t—24 to 34 inches; 50 percent pale brown (10YR 6/3) very cobbly sandy loam and 50 percent yellow (10YR 7/6) very cobbly sandy clay, brown (10YR 5/3) and yellowish brown (10YR 5/6) moist; strong medium subangular blocky structure; hard, friable, sticky and plastic; common fine and medium roots; many fine tubular pores; 60 percent cobbles and pebbles; slightly acid; gradual wavy boundary.

B22t—34 to 60 inches; 50 percent pale brown (10YR 6/3) very cobbly heavy sandy clay and 50 percent brownish yellow (10YR 6/6) very cobbly heavy sandy clay, brown (10YR 5/3) and yellowish brown (10YR 5/6) moist; strong medium subangular blocky structure; hard, firm, very sticky and very plastic; few fine roots; common very fine and fine tubular pores; 60 percent cobbles and pebbles; slightly acid.

The solum is 50 to 60 inches thick of more.

The A1 horizon has value of 4 to 6 when dry and 2 to 4 when moist, and it has chroma of 1 to 3 when dry or moist. It is cobbly loam or very cobbly loam and is 20 to 40 percent cobbles and pebbles.

The A2 horizon has hue of 10YR or 7.5YR, value of 6 or 7 when dry and 3 to 5 when moist, and chroma of 2 to 4 when dry or moist. It is sandy loam or loam and is 20 to 45 percent cobbles and pebbles.

The B&A horizon has hue of 10YR or 7.5YR, value of 4 to 7 when dry and 2 to 6 when moist, and chroma of 2 to 6 when dry or moist. It is mainly loam, sandy loam, or heavy loam and has thin strata of sandy clay in the lower part in most pedons. The B&A horizon is 45 to 60 percent rock fragments. Some pedons have an A&B horizon that is similar in color to the B&A horizon. The A&B horizon, where present, is loam or sandy loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 7 when dry and 4 or 5 when moist, and chroma of 3 to 6 when dry or moist. It is sandy clay, clay loam, or heavy clay loam. The horizon is 45 to 60 percent cobbles and pebbles and has a few stones.

Manzano Series

The soils in the Manzano series are classified as fine-loamy, mixed, mesic Cumulic Haplustolls. These deep, well drained soils formed in alluvial sediment derived from various kinds of rock. They are on valley floors, stream terraces, and lower lying side slopes and along drainageways. Slope is 1 to 3 percent. Elevation is 5,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of Manzano loam, 1 to 3 percent slopes; about 2.5 miles east of Valmora, along New Mexico Highway 97, and 0.25 mile north of railroad bridge in the southeast corner of sec. 2, T. 18 N., R. 19 E.; in the Mora Land Grant.

A1—0 to 9 inches; dark brown (7.5YR 4/2) loam, very dark brown (7.5YR 2/2) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine interstitial pores; mildly alkaline; clear smooth boundary.

B2—9 to 24 inches; brown (7.5YR 5/2) clay loam, dark brown (7.5YR 3/2) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine tubular pores; slightly effervescent; moderately alkaline; clear wavy boundary.

B3ca—24 to 35 inches; pinkish gray (7.5YR 6/2) silt loam, dark brown (7.5YR 4/2) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine tubular pores; strongly effervescent; 10 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

Cca—35 to 60 inches; light reddish brown (5YR 6/3) loam, dark reddish brown (5YR 3/3) moist; massive; soft, very friable, slightly sticky and slightly plastic; few very fine roots; violently effervescent; 12 percent calcium carbonate equivalent; disseminated lime throughout; moderately alkaline.

The profile is mildly alkaline or moderately alkaline. Depth to a layer of calcium carbonate accumulation generally is 16 to 30 inches. Calcium carbonate equivalent is less than 15 percent throughout.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 to 4 when dry or moist.

The B horizon has hue of 5YR, 7.5YR, or 10YR, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is loam, silt loam, sandy clay loam, or clay loam.

The C horizon, where present, generally is stratified.

Mion Series

The soils in the Mion series are classified as clayey, mixed (calcareous), mesic, shallow Ustic Torriorthents. These shallow, well drained soils formed in fine textured material derived mainly from shale. They are on upland hills and along ridges. Slope is 3 to 35 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Mion silty clay loam in an area of Litle-Mion association, moderately sloping; about 15 miles southeast of Wagon Mound, along New Mexico Highway 271; in the south half of the NW1/4 of sec. 27, T. 19 N., R. 23 E.

A—0 to 4 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; weak very fine granular structure; slightly hard, very friable, sticky and plastic; many very fine and fine roots; common very fine tubular pores; 5 percent thin shale fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

AC—4 to 15 inches; light olive brown (2.5Y 5/3) clay, olive brown (2.5 4/3) moist; weak coarse prismatic structure parting to moderate medium angular blocky; hard, firm, very sticky and very plastic; many very fine and fine roots; many fine tubular pores; violently effervescent; moderately alkaline; abrupt wavy boundary.

Cr—15 inches; light olive brown and olive brown shale; lime between thin layers of shale; few roots in the upper 3 inches.

Depth to shale ranges from 10 to 20 inches.

The A horizon has hue of 10YR or 2.5Y, value of 4 to 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is silty clay loam, flaggy silt loam, flaggy silty clay loam, or very flaggy silt loam. The horizon is 0 to 40 percent rock fragments.

The AC horizon has hue of 10YR to 5Y, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 2 to 4 when dry or moist. It is clay, flaggy silty clay, or flaggy clay.

Moreno Series

The soils in the Moreno series are classified as fine, mixed Typic Argiborolls. These deep, well drained soils formed in fine textured alluvial sediment derived mainly from sandstone and shale. They are in alluvial mountain valleys. Slope is 3 to 15 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 18 inches, the average annual air temperature is 42 to 45 degrees F, and the frost-free period is 85 to 110 days.

Typical pedon of a Moreno loam in an area of Moreno loam, 3 to 8 percent slopes; along road about 1.5 miles north of North Carmen; in the south half of sec. 28, T. 20 N, R. 15 E.; in the Mora Land Grant.

A1—0 to 10 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak fine and medium granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many fine interstitial pores; mildly alkaline; clear smooth boundary.

B1—10 to 15 inches; brown (10YR 5/3) light clay loam, dark brown (10YR 4/3) moist; weak medium prismatic structure parting to moderate medium subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine tubular pores; mildly alkaline; clear smooth boundary.

B21t—15 to 30 inches; reddish brown (5YR 5/3) heavy clay loam, reddish brown (5YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and plastic; many fine roots; many fine and medium tubular pores; few thin clay films on faces of peds and in pores; mildly alkaline; clear smooth boundary.

B22t—30 to 49 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; weak medium prismatic structure parting to strong medium subangular blocky; slightly hard, very friable, sticky and plastic; common very fine and fine roots; common fine tubular pores; common thin clay films on faces of peds; 10 percent pebbles; mildly alkaline; clear smooth boundary.

C—49 to 60 inches; brown (7.5YR 5/4) light clay loam, dark brown (7.5YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; few fine roots and pores; 10 percent pebbles; mildly alkaline.

The A horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 or 5 when dry, and chroma of 2 or 3 when dry or moist. It is loam or sandy clay loam.

The B2t horizon has hue of 7.5YR or 5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 6 when dry or moist. It is clay loam or clay.

The C horizon has hue of 2.5YR, 5YR, or 7.5YR. It is gravelly heavy sandy clay loam, sandy clay, or clay loam and is 5 to 20 percent pebbles.

Nambe Variant

The soils in the Nambe Variant are classified as loamy-skeletal, mixed Typic Cryochrepts. These deep, well drained soils formed in material derived mainly from gneiss, schist, and other metamorphic rock. They are on mountainsides. Slope is 40 to 80 percent. Elevation is 10,000 to 11,500 feet. The average annual precipitation is 22 to 30 inches, the average air temperature is 38 to 42 degrees F, and the frost-free period is 40 to 80 days.

Typical pedon of a Nambe Variant very stony sandy loam in an area of Nambe Variant-Rock outcrop-Rubble land complex, extremely steep; along Gascon Pack Trail, halfway between the switchback at 10,000 feet and Enchanted Lake turnoff; in the NW1/4 of sec. 4, T. 19 N., R. 14 E.; in the Mora Land Grant.

O—3 inches to 0; decomposing forest litter.

A21—0 to 10 inches; pale brown (10YR 6/3) very stony sandy loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; soft, very friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many fine interstitial pores; 35 percent stones and cobbles; slightly acid; clear wavy boundary.

A22—10 to 21 inches; very pale brown (10YR 7/3) very stony sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; loose, very friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many fine interstitial pores; 40 percent stones and cobbles; slightly acid; gradual wavy boundary.

B2—21 to 35 inches; very pale brown (10YR 7/4) very stony heavy sandy loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; soft, friable, nonsticky and nonplastic; many fine, medium, and coarse roots; many fine and medium tubular pores; 60 percent stones and cobbles; slightly acid; gradual wavy boundary.

C—35 to 60 inches; very pale brown (10YR 7/4) very stony light sandy loam, yellowish brown (10YR 5/4) moist; single grain; soft, friable, nonsticky and nonplastic; many fine and medium roots in upper part; many fine, medium, and coarse tubular pores; 60 percent stones and cobbles; slightly acid.

Depth to bedrock is more than 60 inches. Thickness of the solum ranges from 18 to 40 inches. Some pedons have a thin A1 horizon.

The A2 horizon has hue to 10YR or 7.5YR, value of 5 to 7 when dry and 4 or 5 when moist, and chroma of 2 or 3 when dry or moist. It is sandy loam, loam, or fine sandy loam and is 30 to 50 percent stones, cobbles, and pebbles.

The B2 horizon has hue of 10YR or 7.5YR, value of 4 to 7 when dry and 3 to 5 when moist, and chroma of 2 to 6 when dry or moist. It is sandy loam, heavy sandy loam, or fine sandy loam and is 50 to 80 percent stones and cobbles.

Partri Series

The soils in the Partri series are classified as fine, mixed, mesic Aridic Argiustolls. These deep, well drained soils formed in mixed alluvium derived mainly from limestone, sandstone, and basalt. They are on upland side slopes. Slope is 1 to 5 percent. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Partri loam in an area of Partri-Carnero-Bernal association, undulating; about 20 miles southeast of Wagon Mound, along New Mexico Highway 271; in the SW1/4NE1/4 of sec. 35, T. 19 N., R. 23 E.

A1—0 to 3 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to moderate very fine granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular and interstitial pores; neutral; clear smooth boundary.

B1t—3 to 11 inches; brown (7.5YR 5/3) clay loam, dark brown (7.5YR 3/3) moist; strong medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots; many fine tubular pores; common thin clay films on faces of peds; mildly alkaline; clear smooth boundary.

B22t—11 to 22 inches; brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; moderate coarse and very coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, sticky and plastic; few fine and common very fine roots; common fine tubular pores; many moderately thick clay films on faces of peds; slightly effervescent in lower part; moderately alkaline; clear wavy boundary.

B23t—22 to 35 inches; brown (7.5YR 5/4) clay, dark brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine roots; many fine tubular pores; many moderately thick clay films on faces of peds; strongly effervescent; carbonates segregated into common medium soft nodules; moderately alkaline; clear wavy boundary.

C1ca—35 to 51 inches; light brown (7.5YR 6/4) gravelly loam, strong brown (7.5YR 5/6) moist; weak fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine roots; many fine and medium tubular pores; 15 percent caliche pebbles; violently effervescent; 34 percent calcium carbonate equivalent; nearly continuous coatings of calcium carbonate on faces of peds in upper part and disseminated throughout lower part; moderately alkaline; clear wavy boundary.

C2ca—51 to 60 inches; pink (7.5YR 7/4) gravelly loam, light brown (7.5YR 6/4) moist; massive; hard, friable, slightly sticky and slightly plastic; few very fine roots in upper part; common fine and medium tubular pores; 15 percent caliche pebbles; violently effervescent; 35 percent calcium carbonate equivalent; carbonates disseminated throughout; moderately alkaline.

The solum and depth to the calcic horizon range from 20 to 35 inches (fig. 18).

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The Bt horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 to 6 when dry or moist. It is heavy clay loam, silty clay loam, silty clay, or clay.

The Cca horizon is 0 to 20 percent pebbles and 15 to 40 percent calcium carbonate equivalent.

Penrose Series

The soils in the Penrose series are classified as loamy, carbonatic, mesic Lithic Ustic Torriorthents. These shallow, well drained soils formed in calcareous material derived mainly from limestone interbedded with shale. They are on upland hills and mesa tops and along ridges. Slope is 3 to 15 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Penrose channery loam in an area of Penrose-Mion-Litle association, moderately sloping; about 12 miles southeast of Wagon Mound, along New Mexico Highway 271; in the east half of the SE1/4 of sec. 18, T. 19 N., R. 23 E.

A1—0 to 5 inches; grayish brown (10YR 5/2) channery loam, very dark grayish brown (10YR 3/2) moist; weak very fine granular structure; slightly hard, very

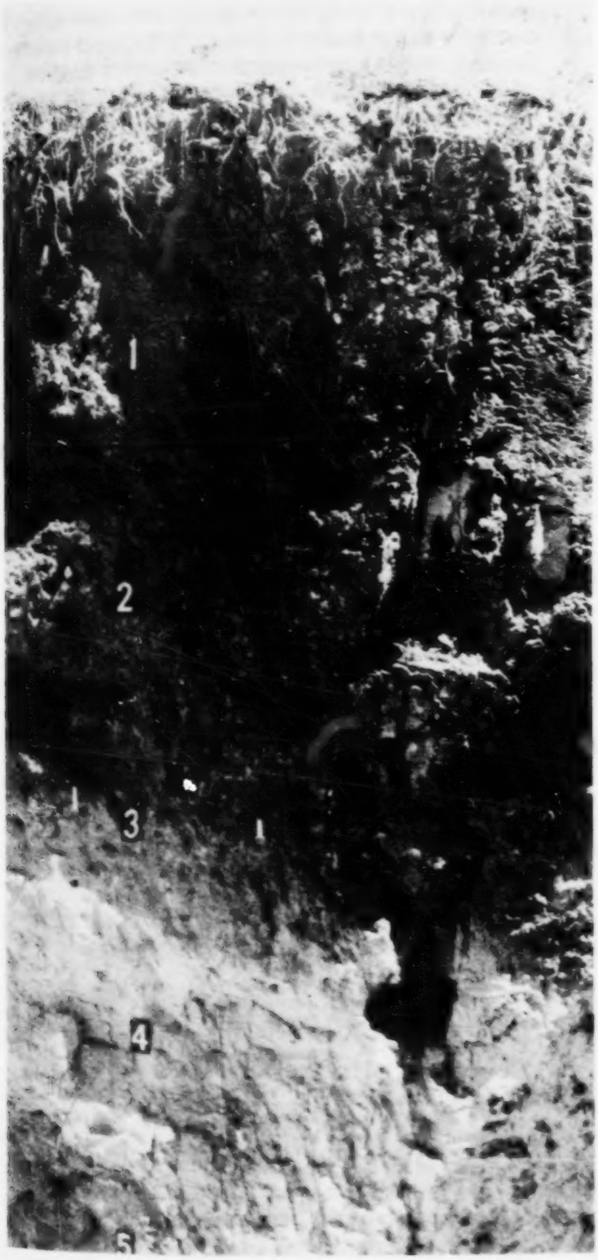

Figure 18.—Profile of Partri loam showing accumulation of calcium carbonate below a depth of about 35 inches. Depth is marked in feet.

friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; 15 percent limestone channery fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

C—5 to 19 inches; gray (10YR 5/1) channery loam, very dark grayish brown (10YR 3/2) moist; massive; loose, very friable, slightly sticky and slightly plastic; many very fine and fine roots; 30 percent limestone channery fragments; violently effervescent; 12 percent calcium carbonate equivalent; moderately alkaline; abrupt smooth boundary.

R—19 inches; hard gray limestone; generally fractured into ledges 2 to 4 inches thick that are separated by thin beds of shale.

Depth to bedrock ranges from 10 to 20 inches. The profile is 15 to 35 percent rock fragments, mainly cobbles and pebbles.

The A horizon has hue of 2.5Y or 10YR, value of 5 or 6 when dry and 3 to 5 when moist, and chroma of 2 or 3 when dry or moist.

The C horizon has hue of 2.5Y or 10YR, value of 5 to 7 when dry and 3 to 5 when moist, and chroma of 1 to 3 when dry or moist. It is channery loam or channery light clay loam.

Penrose Variant

The soils in the Penrose Variant are classified as loamy-skeletal, mixed (calcareous), mesic Lithic Ustic Torriorthents. These shallow, well drained soils formed in calcareous material derived mainly from limestone interbedded with shale. They are on upland hills, mesa tops, and side slopes and along ridges. Slope is 3 to 45 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Penrose Variant very channery loam in an area of Mion-Penrose Variant-Rock outcrop complex, very steep; about 4 miles southeast of Red River Ranch headquarters; in the NW1/4NE1/4 of sec. 24, T. 23 N., R. 22 E.

A11—0 to 3 inches; grayish brown (10YR 5/2) very channery loam, dark grayish brown (10YR 4/2) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; 45 to 55 percent limestone channery fragments; strongly effervescent; 8 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

A12—3 to 8 inches; grayish brown (10YR 5/2) very channery loam, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; common medium tubular pores; 45 to 55 percent limestone channery fragments; violently effervescent; 10 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

C—8 to 18 inches; light brownish gray (10YR 6/2) very channery loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common medium tubular pores; 40 percent limestone channery fragments; violently effervescent, 12 percent calcium carbonate equivalent; moderately alkaline; abrupt wavy boundary.

R—18 inches; light grayish brown and grayish brown limestone that has thin beds of shale between layers.

Depth to bedrock is 10 to 20 inches. Content of rock fragments, mainly limestone channery fragments, ranges from 30 to 60 percent throughout.

The A horizon has value of 4 to 7 when dry and 3 or 4 when moist, and it has chroma of 2 or 3 when dry or moist. It is channery loam or very channery loam.

The C horizon has hue of 10YR or 2.5Y, value of 5 to 7 when dry and 3 to 5 when moist, and chroma of 2 or 3 when dry or moist.

Pidineen Series

The soils in the Pidineen series are classified as loamy, mixed, mesic, shallow Petrocalcic Calciustolls. These shallow, well drained soils formed in alluvial material derived mainly from basalt and modified with eolian material. They are on slightly convex upper side slopes and ridges in areas of basalt flows. Slope is 1 to 5 percent. Elevation is 6,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 155 days.

Typical pedon of a Pidineen stony loam in an area of Pidineen-Tricon complex, undulating; about 12 miles northwest and 6 miles south of Wagon Mound; in the north half of sec. 15, T. 21 N., R. 19 E.; in the Mora Land Grant.

A11—0 to 3 inches; brown (10YR 4/3) stony loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine granular structure; loose, very friable, slightly sticky and slightly plastic; many very fine and fine interstitial pores; 10 percent stones, 5 percent cobbles, and 5 percent pebbles; strongly effervescent; 4 percent calcium carbonate; moderately alkaline; clear smooth boundary.

A12—3 to 7 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine and common medium tubular pores; 3 percent basalt and caliche pebbles; violently effervescent; 5 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

B2—7 to 13 inches; brown (10YR 4/3) light clay loam, dark brown (10YR 3/3) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many very fine and common fine roots; many fine and common medium tubular pores; 5 percent basalt and caliche pebbles; violently effervescent; 10 percent calcium carbonate equivalent; moderately alkaline; clear smooth boundary.

C1ca—13 to 16 inches; brown (10YR 5/3) gravelly loam, brown (10YR 4/3) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; 25 percent basalt and caliche pebbles; violently effervescent; 15 percent calcium carbonate equivalent; moderately alkaline; clear wavy boundary.

C2cam—16 inches; white (10YR 8/2) indurated caliche that is laminar on the surface.

Depth to the petrocalcic horizon ranges from 10 to 20 inches. The calcium carbonate equivalent ranges from 3 to 15 percent throughout.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is 5 to 10 percent stones, 5 to 10 percent cobbles, and 5 to 10 percent pebbles.

The B horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4 when dry or moist. It commonly is light clay loam, but the range includes loam and silt loam. This horizon is 0 to 5 percent stones, 0 to 5 percent cobbles, and 0 to 5 percent pebbles.

The C horizon, where present, is loam or silt loam and is 0 to 10 percent cobbles and 15 to 25 percent pebbles

Raton Series

The soils in the Raton series are classified as clayey-skeletal, mixed Lithic Argiborolls. These shallow, well drained soils formed in residuum derived mainly from basalt. They are on basalt-capped mesas, ridges, and side slopes in areas of basalt flows. Slope is 3 to 40 percent. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 42 to 45 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of a Raton very cobbly loam in an area of Dalcon-Raton complex, undulating; about 4 miles from the village of Guadalupita, at the south end of La Mesa and 25 feet east of ranch road, in sec. 12, T. 22 N., R. 16 E.; in the Mora Land Grant.

A1—0 to 6 inches; brown (7.5YR 4/2) very cobbly loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure parting to moderate medium granular; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine interstitial pores; 50 percent cobbles and pebbles; neutral; clear smooth boundary.

B2t—6 to 12 inches; brown (7.5YR 4/2) very stony silty clay, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, firm, sticky and plastic; many very fine and fine roots; common very fine and fine tubular pores; common thin clay films on faces of peds; 55 percent stones and cobbles; neutral; abrupt wavy boundary.

R—12 inches; hard basalt.

Thickness of the solum, depth to bedrock, and thickness of the mollic epipedon range from 10 to 20 inches. The rock fragments are rounded basalt stones, cobbles, pebbles, and boulders.

The A horizon has hue of 7.5YR or 10YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or silt loam and is 40 to 70 percent rock fragments.

The Bt horizon has hue of 7.5YR or 5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It ranges from clay loam to clay or silty clay. It is more than 35 percent clay and is 40 to 70 percent rock fragments.

Remunda Series

The soils in the Remunda series are classified as fine, mixed, mesic Aridic Argiustolls. These deep, well drained soils formed in old alluvium derived mainly from mixed sedimentary rocks. They are on valley sides and on side slopes in the Rainsville area. Slope is 0 to 5 percent. Elevation is 6,500 to 7,400 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Remunda loam in an area of Remunda-Lavate Variant association, gently sloping; about 0.5 mile east of Rainsville, along Salman Ranch road; in the SW1/4 of sec. 12, T. 20 N., R. 16 E.; in the Mora Land Grant.

A1—0 to 10 inches; brown (7.5YR 4/2) loam, dark brown (7.5YR 3/2) moist; moderate fine platy structure in upper 2 inches and weak medium subangular blocky structure in lower 8 inches; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine interstitial pores; mildly alkaline; clear smooth boundary.

B1—10 to 15 inches; reddish brown (5YR 4/3) loam, dark reddish brown (5YR 3/3) moist; weak very coarse prismatic structure parting to weak coarse prismatic; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine tubular pores and common medium tubular pores; very few thin clay films on faces of peds and in pores; mildly alkaline; clear smooth boundary.

B21t—15 to 26 inches; reddish brown (5YR 4/4) clay loam, reddish brown (5YR 4/3) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; slightly hard, friable, sticky and plastic; common fine and many very fine roots; many very fine and fine tubular pores; many thin clay films on faces of peds; mildly alkaline; clear smooth boundary.

B22t—26 to 34 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to moderate coarse subangular blocky; hard, firm, very sticky and very plastic; common very fine roots; many very fine and fine tubular pores; common thin clay films on faces of peds; slightly effervescent in lower part; carbonates segregated as few fine filaments; moderately alkaline; clear wavy boundary.

B3—34 to 52 inches; reddish brown (5YR 5/4) heavy clay loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine roots; strongly effervescent; carbonates segregated as many fine filaments; moderately alkaline; gradual smooth boundary.

Cca—52 to 60 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 5/4) moist; massive; loose, slightly sticky and slightly plastic; common fine tubular pores; strongly effervescent; less than 10 percent calcium carbonate equivalent; many fine filaments and common fine soft masses of calcium carbonate; moderately alkaline.

Thickness of the solum is 37 to 60 inches or more. The mollic epipedon is 10 to 15 inches thick. Depth to a layer of calcium carbonate accumulation is 34 to 60 inches or more.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or clay loam.

The Bt horizon has hue of 5YR to 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4 when dry or moist. It is clay loam or light clay and is more than 35 percent clay.

The C horizon, where present, has hue of 5YR to 10YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4 when dry or moist. It is loam or clay loam.

Rocio Series

The soils in the Rocio series are classified as fine, mixed Mollic Eutroboralfs. These deep, well drained soils formed in alluvial and colluvial material derived mainly from sandstone and shale. They are on convex mountainsides. Slope is 9 to 50 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 24 inches, the average annual air temperature is 40 to 46 degrees F, and the frost-free period is 90 to 110 days.

Typical pedon of a Rocio stony loam in an area of Dargol-Rocio-Vamer association, very steep; halfway up slope along south side of Rito Morphy, about 2 miles west of Ledoux; in the southwest corner of the NW1/4 of sec. 29, T. 20 N., R. 15 E.; in the Mora Land Grant.

O—1 inch to 0; forest litter.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many fine, medium, and coarse roots; many fine interstitial pores; 5 percent pebbles, 5 percent cobbles, and 10 percent stones; neutral; clear smooth boundary.

A2—5 to 15 inches; brown (10YR 5/3) stony loam, dark brown (10YR 4/3) moist; weak medium granular structure and weak medium subangular blocky structure; hard, friable, slightly sticky and plastic; many fine, medium, and coarse roots; many fine and medium tubular pores; 10 percent pebbles and 5 percent stones; neutral; clear wavy boundary.

B21t—15 to 26 inches; brownish yellow (10YR 6/6) clay, yellowish brown (10YR 5/6) moist; strong medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; many fine, medium, and coarse roots; common very fine and fine tubular pores; many thin clay films and few small black blotches and streaks on faces of peds; 5 percent pebbles; neutral; gradual wavy boundary.

B22t—26 to 52 inches; light yellowish brown (10YR 6/4) clay, yellowish brown (10YR 5/4) moist; strong medium and coarse subangular blocky structure; very hard, firm, very sticky and very plastic; common fine, medium, and coarse roots; common very fine tubular pores; common thin clay films and few small black blotches and streaks on faces of peds; few pebbles; neutral; diffuse irregular boundary.

B3—52 to 65 inches; light yellowish brown (10YR 6/4) clay, 50 percent yellowish brown (10YR 5/6) and 50 percent brown (10YR 5/3) moist; weak coarse subangular blocky structure and massive; very hard, firm, very sticky and very plastic; few fine roots in upper part; common very fine and fine tubular pores; 10 percent cobbles; neutral.

The A1 horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 3 when dry or moist. It is stony loam or gravelly loam and is 15 to 20 percent pebbles, 0 to 10 percent cobbles, and 0 to 10 percent stones. The A2 horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4 when dry or moist. It is stony loam or gravelly loam.

The B2t horizon has hue of 10YR or 7.5YR, value of 4 to 6 when dry or moist, and chroma of 3 to 6 when dry or moist. It is clay or silty clay and is more than 45 percent clay.

Saladon Series

The soils in the Saladon series are classified as fine, montmorillonitic Typic Cryaquolls. These deep, very poorly drained soils formed in fine textured alluvium derived mainly from basalt. They are in depressional areas and swales in areas of basalt flows. Slope is 0 to 2 percent. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 41 to 44 degrees F, and the frost-free period is 85 to 105 days.

Typical pedon of a Saladon mucky silty clay loam in an area of Yankee-Saladon association, gently sloping; about 4.5 miles from the village of Guadalupita, at south end of La Mesa, 1.0 mile from Hermit Line shack; in the NE1/4 of sec. 31, T. 22 N., R. 17 E.; in the Mora Land Grant.

A11—0 to 4 inches; very dark brown (10YR 2/2) mucky silty clay loam, very dark grayish brown (10YR 3/2) dry; weak fine granular structure; soft, friable, sticky and plastic; many very fine and fine roots; many fine interstitial pores; neutral; clear smooth boundary.

A12—4 to 15 inches; very dark brown (10YR 2/2) silty clay, very dark grayish brown (10YR 3/2) dry; strong fine and medium granular structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; many very fine and fine tubular pores; neutral; clear wavy boundary.

Clg—15 to 30 inches; dark gray (5Y 4/1) clay, gray (5Y 5/1) dry; common medium faint olive (5Y 5/4) mottles; massive; hard, firm, very sticky and very plastic; few fine roots; common very fine tubular pores; neutral; gradual wavy boundary.

C2g—30 to 60 inches; dark gray (5Y 4/1) clay, gray (5Y 5/1) dry; few medium faint olive (5Y 5/4) mottles; massive; hard, firm, very sticky and very plastic; few very fine tubular pores.

The A horizon has value of 2 or 3 when dry or moist, and it has chroma of 1 or 2 when dry or moist.

The C horizon has hue of 5Y, 2.5Y, or 10YR, and it has chroma of 1 or 2 when dry or moist. It is clay or silty clay.

Sombordoro Series

The soils in the Sombordoro series are classified as clayey-skeletal, mixed, mesic Lithic Haplustalfs. These shallow, well drained soils formed in material derived mainly from sandstone and shale. They are on upland benches and canyonsides and along ridges. Slope is 5 to 45 percent. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Sombordoro very stony loam in an area of Sombordoro-Rock outcrop-Tuloso complex, moderately sloping; about 12 miles east of Wagon Mound, along New Mexico Highway 120, and 2 miles north and 6 miles east on Mills Canyon Road; in the SW1/4 of sec. 22, T. 21. N., R. 24 E.

A1—0 to 3 inches; brown (7.5YR 4/4) very stony sandy loam, dark brown (7.5YR 4/2) moist; moderate very fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; 15 percent stones, 15 percent cobbles, and 15 percent pebbles; neutral; clear smooth boundary.

B2t—3 to 14 inches; reddish brown (5YR 4/4) very stony sandy clay, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; hard, firm, sticky and plastic; many very fine and fine roots; common fine tubular pores; 25 percent stones, 20 percent cobbles, and 15 percent pebbles; slightly acid; abrupt wavy boundary.

R—14 inches; hard, red sandstone.

Thickness of the solum and depth to bedrock range from 6 to 18 inches. The surface layer commonly is 35 to 60 percent rock fragments.

The A horizon has hue of 7.5YR or 5YR, value of 4 to 6 when dry, and chroma of 2 to 4 when dry or moist.

The B horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 to 5 when moist, and chroma of 4 or 5 when dry or moist. It is very stony sandy clay or very stony light clay and is 35 to 60 percent rock fragments.

Spud Series

The soils in the Spud series are classified as fine, montmorillonitic Mollic Eutroboralfs. These deep, well drained soils formed in fine textured alluvial, colluvial, and residual material derived mainly from basalt and modified with sandstone and shale. They are on mountainsides. Slope is 25 to 50 percent. Elevation is 8,000 to 10,000 feet. The average annual precipitation is 18 to 20 inches, the average annual air temperature is 40 to 45 degrees F, and the frost-free period is 80 to 110 days.

Typical pedon of a Spud very stony loam in an area of Spud-Burnac association, very steep, about 5.5 miles northwest of Ocate via Black Lake Road and 20 feet east of mountain road; in the NW1/4 of sec. 2, T. 23 N., R. 17 E.; in the Mora Land Grant.

O—2 inches to 0; decomposing forest litter.

A1—0 to 5 inches; dark gray (N 4/0) very stony loam, black (N 2/0) moist; moderate very fine and fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine and fine interstitial pores; 15 percent stones, 30 percent cobbles, and 10 percent pebbles; slightly acid; clear smooth boundary.

A21—5 to 11 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure parting to moderate fine and medium granular; soft, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many fine, medium, and coarse tubular pores; 15 percent stones, 20 percent cobbles, and 5 percent pebbles; slightly acid; clear wavy boundary.

A22—11 to 22 inches; brown (10YR 5/3) very stony loam, dark brown (10YR 4/3) moist; weak medium and coarse subangular blocky structure parting to strong medium and coarse granular; hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many fine, medium, and coarse tubular pores; 10 percent stones, 20 percent cobbles, and 5 percent pebbles; slightly acid; clear wavy boundary.

B&A—22 to 26 inches; brown (7.5YR 5/4) clay loam, 70 percent dark brown (7.5YR 4/4) and 30 percent brown (7.5YR 5/4) moist; weak and moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; many very fine, fine, medium, and coarse roots; many fine tubular pores and common medium and coarse tubular pores; common thin clay films on faces of peds and in pores of B material; 5 percent stones, 6 percent cobbles, and 3 percent pebbles; slightly acid; clear wavy boundary.

B21t—26 to 36 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; strong medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine, fine, and coarse roots and many medium roots; many very fine and fine tubular pores and common coarse tubular pores; many thin clay films on faces of peds and in pores; few medium pockets of A2 material in upper part; 8 percent stones, 3 percent cobbles, and 3 percent pebbles; neutral; gradual wavy boundary.

B22t—36 to 49 inches; reddish brown (5YR 5/4) clay, reddish brown (5YR 4/4) moist; strong medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine and fine roots and common medium and coarse roots; many very fine and fine tubular pores; many thin clay films and few moderately thick clay films on faces of peds; 8 percent stones, 3 percent cobbles, and 3 percent pebbles; neutral; gradual wavy boundary.

B23t—49 to 56 inches; reddish brown (5YR 5/4) stony clay loam, reddish brown (5YR 4/4) moist; strong coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; common very fine, fine, and medium roots; many very fine and fine tubular pores; many thin clay films and very few moderately thick clay films on faces of peds; 8 percent stones, 4 percent cobbles, and 3 percent pebbles; neutral; gradual wavy boundary.

B24t—56 to 68 inches; reddish brown (5YR 5/4) stony clay loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; very hard, firm, sticky and plastic; many very fine, fine, medium, and coarse roots; many very fine and fine tubular pores; common thin clay films, many medium black root channels, and many medium black blotches on faces of peds; 8 percent stones, 4 percent cobbles, and 3 percent pebbles; neutral; diffuse irregular boundary.

B3—68 to 78 inches; reddish brown (5YR 5/4) very stony sandy clay loam, reddish brown (5YR 4/4) moist; moderate coarse subangular blocky structure; very hard, firm, slightly sticky and plastic; many very fine and fine tubular pores; few thin clay films and many medium black blotches on faces of peds; 20 percent stones, 15 percent cobbles, and 7 percent pebbles; neutral.

Thickness of the solum typically is more than 60 inches, but it is as little as 40 inches. The profile generally has a 2- to 4-inch transitional layer between the A2 and B2t horizons. Some pedons have a thin C horizon.

The A1 horizon has hue of 10YR, 7.5YR, or neutral, value of 3 to 5 when dry and 2 or 3 when moist, and chroma of 0 to 3 when dry or moist. It is 10 to 15 percent stones, 20 to 30 percent cobbles, and 5 to 10 percent pebbles. The A2 horizon has hue of 10YR, 7.5YR, or 5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 2 to 4 when dry or moist. It commonly is loam, but the range includes fine sandy loam. The horizon is 10 to 20 percent stones, 20 to 30 percent cobbles, and 5 to 10 percent pebbles.

The B2t horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 4 to 6 when dry and 3 to 5 when moist, and chroma of 4 to 6 when dry or moist. It commonly is clay, but the range includes silty clay and heavy clay loam. The upper part of the horizon is 0 to 10 percent stones, 0 to 5 percent cobbles, and 0 to 5 percent pebbles, and the lower part is 5 to 10 percent stones, 3 to 15 percent cobbles, and 3 to 10 percent pebbles. The B3 horizon has hue of 7.5YR, 5YR, or 2.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 4 to 6 when dry or moist. It commonly is sandy clay loam, but the range includes sandy clay and clay loam. The horizon is 15 to 30 percent stones, 10 to 15 percent cobbles, and 10 to 15 percent pebbles.

Swastika Series

The soils in the Swastika series are classified as fine, mixed, mesic Aridic Argiustolls. These deep, well drained soils formed in fine textured residuum derived mainly from shale. They are on upland side slopes. Slope is 0 to 5 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of Swastika silt loam, gently sloping; about 5 miles north and 3 miles east of Wagon Mound and 200 feet south of ranch road; in the NE1/4NW1/4 of sec. 5, T. 21 N., R. 22 E.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; moderately alkaline; clear smooth boundary.

B1—5 to 10 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; slightly hard, friable, sticky and plastic; many very fine and fine roots and common medium roots; common fine tubular pores; moderately alkaline; clear smooth boundary.

B21t—10 to 17 inches; brown (10YR 5/3) silty clay, dark brown (10YR 4/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, firm, sticky and very plastic; common very fine and fine roots; many fine tubular pores; many thin clay films on faces of peds; moderately alkaline; gradual smooth boundary.

B22t—17 to 23 inches; brown (10YR 5/3) silty clay loam, dark brown (10YR 4/3) moist; moderate coarse subangular blocky structure parting to moderate medium subangular blocky; very hard, firm, sticky and plastic; few very fine roots; many fine tubular pores; common thin clay films on faces of peds; slightly effervescent; less than 5 percent calcium carbonate equivalent; moderately alkaline; gradual smooth boundary.

B3ca—23 to 33 inches; very pale brown (10YR 7/4) silty clay loam, light yellowish brown (10YR 6/4) moist; weak medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine roots; few fine tubular pores; strongly effervescent; nearly continuous thin lime coatings on faces of peds; less than 10 percent calcium carbonate equivalent; moderately alkaline; gradual smooth boundary.

Cca—33 to 60 inches; light yellowish brown (10YR 6/4) silt loam, yellowish brown (10YR 5/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; strongly effervescent; disseminated lime throughout; 10 percent calcium carbonate equivalent; moderately alkaline.

Thickness of the solum ranges from 24 to 40 inches. The mollic epipedon is 10 to 20 inches thick.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 or 3 when dry or moist. It is silt loam or silty clay loam.

The B21t horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist.

The B22t horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 3 or 4 when dry or moist. The Bt horizon ranges from silty clay loam or clay loam to silty clay. It is more than 35 percent clay.

The C horizon has hue of 10YR or 7.5YR, value of 6 or 7 when dry and 4 or 5 when moist, and chroma of 3 or 4 when dry or moist. Calcium carbonate equivalent ranges from 5 to 14 percent. !

Thunderbird Series

The soils in the Thunderbird series are classified as fine, montmorillonitic, mesic Aridic Argiustolls. These moderately deep, well drained soils formed in fine textured material derived mainly from basalt and modified with eolian material. They are on low hills and side slopes in the Maxson Crater basalt flow. Slope is 2 to 8 percent. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 47 to 53 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Thunderbird cobbly loam in an area of Torreon-Thunderbird association, gently sloping; about 5 miles northeast of Watrous, along Interstate 25; in the SE1/4 of sec. 15, T. 19 N., R. 19 E.; in the Mora Land Grant.

A1—0 to 2 inches; brown (7.5YR 4/2) cobbly loam, dark brown (7.5YR 3/2) moist; weak fine granular structure; loose, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine interstitial pores; 15 percent cobbles; neutral; clear smooth boundary.

B1t—2 to 8 inches; brown (7.5YR 4/2) silty clay loam, dark brown (7.5YR 3/2) moist; weak medium and coarse subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, slightly sticky and plastic; many very fine and fine roots; many fine tubular pores; 5 percent cobbles; coatings of calcium carbonate on rock fragments; mildly alkaline; clear smooth boundary.

B21t—8 to 18 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores; few thin clay films on faces of peds; 5 percent cobbles; coatings of calcium carbonate on rock fragments; mildly alkaline; clear smooth boundary.

B22t—18 to 24 inches; brown (7.5YR 5/2) clay, dark brown (7.5YR 4/2) moist; weak medium and coarse prismatic structure parting to moderate medium subangular blocky; very hard, firm, very sticky and very plastic; few very fine and fine roots; common very fine tubular pores; common thin clay films on faces of peds; 5 percent cobbles; coatings of calcium carbonate on rock fragments; slightly effervescent; moderately alkaline; clear wavy boundary.

B3tca—24 to 30 inches; brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; weak medium subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; few fine tubular pores; few thin clay films on faces of peds; 5 percent cobbles; coatings of calcium carbonate on rock fragments; strongly effervescent; 5 percent calcium carbonate equivalent; moderately alkaline; gradual wavy boundary.

C1ca—30 to 36 inches; light brown (7.5YR 6/4) cobbly clay loam, brown (7.5YR 5/4) moist; massive; slightly hard, firm, sticky and plastic; few very fine roots; common fine and medium tubular pores; 15 percent cobbles; violently effervescent; 10 percent calcium carbonate equivalent; coatings of calcium carbonate on rock fragments; moderately alkaline; abrupt wavy boundary.

R—36 inches; hard basalt; thin discontinuous calcium carbonate accumulations on the surface.

Depth to basalt ranges from 20 to 40 inches. Most pedons have a B3tca horizon. Some pedons have a Cca horizon.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The B2t horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is clay, silty clay, or heavy clay loam and is 5 to 20 percent rock fragments.

Tinaja Series

The soils in the Tinaja series are classified as loamy-skeletal, mixed, mesic Aridic Ustochrepts. These deep, well drained soils formed in medium or coarse textured gravelly alluvial material derived from various kinds of rock. They are on convex terrace remnants. Slope is 5 to

30 percent. Elevation is 6,000 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of Tinaja gravelly loam, moderately steep, about 2 miles south of Rainsville; in the north half of sec. 28, T. 20 N., R. 16 E.; in the Mora Land Grant.

A1—0 to 3 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate very fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; 15 percent rounded pebbles; few thin lime skirts on undersides of pebbles; moderately alkaline; clear smooth boundary.

B1—3 to 10 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine tubular pores and common tubular pores; 15 percent pebbles and 5 percent cobbles; few thin lime skirts on undersides of rock fragments; moderately akaline; clear wavy boundary.

B2ca—10 to 25 inches; pinkish gray (7.5YR 6/2) very gravelly heavy loam, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure parting to strong fine subangular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine and medium and few coarse tubular pores; 40 percent pebbles and 20 percent cobbles; strongly effervescent; 10 percent calcium carbonate equivalent; moderately alkaline; gradual irregular boundary.

IIC1ca—25 to 39 inches; pinkish white (7.5YR 8/2) extremely gravelly loamy sand, light brown (7.5YR 6/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; 55 percent pebbles, 25 percent cobbles, and few stones; violently effervescent; 35 percent calcium carbonate equivalent; moderately alkaline; gradual irregular boundary.

IIC2—39 to 48 inches; light brown (7.5YR 6/4) loamy coarse sand, brown (7.5YR 5/4) moist; massive; loose, nonsticky and nonplastic; few very fine and fine roots; 10 percent fine pebbles; strongly effervescent; 5 percent calcium carbonate equivalent; moderately alkaline; diffuse boundary.

IIC3ca—48 to 68 inches; light brown (7.5YR 6/4) extremely gravelly loamy sand, brown (7.5YR 5/4) moist; massive; soft, very friable, nonsticky and nonplastic; 65 percent pebbles, 20 percent cobbles, and few stones; strongly effervescent; 30 percent calcium carbonate equivalent; moderately alkaline.

The solum is 15 to 29 inches thick. Rock fragments are mainly rounded pebbles and cobbles.

The A horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist.

The B2 horizon has hue of 10YR or 7.5YR, value of 6 or 7 when dry and 4 to 6 when moist, and chroma of 2 to 4 when dry or moist. It is very gravelly loam or very gravelly clay loam and is 35 to 60 percent rounded pebbles and cobbles.

Torreon Series

The soils in the Torreon series are classified as fine, montmorillonitic, mesic Aridic Argiustolls. These deep, well drained soils formed in alluvial material derived mainly from basalt and modified with eolian material. They are on side slopes of the Maxson Crater basalt flow. Slope is 1 to 5 percent. Elevation is 6,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 47 to 53 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Torreon loam in an area of Torreon-Thunderbird association, gently sloping; about 4.5 miles southeast of Wagon Mound, along New Mexico Highway 271; in the extreme southwest corner of sec. 20, T. 20 N., R. 22 E.; in the Mora Land Grant.

A1—0 to 2 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; neutral; clear smooth boundary.

B1—2 to 12 inches; dark grayish brown (10YR 4/2) light clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; many very fine and fine roots; many very fine and fine tubular pores; neutral; clear smooth boundary.

B21t—12 to 25 inches; brown (10YR 5/3) silty clay, dark yellowish brown (10YR 4/4) moist; weak coarse prismatic structure parting to strong medium and coarse subangular blocky; hard, firm, sticky and very plastic; common fine roots and many very fine roots; common fine and medium tubular pores; many thin clay films on faces of peds; strongly effervescent in lower part; mildly alkaline; clear wavy boundary.

B22t—25 to 36 inches; brown (7.5YR 5/4) silty clay, dark brown (7.5YR 4/4) moist; moderate coarse prismatic structure parting to strong medium subangular blocky; very hard, firm, very sticky and very plastic; common fine and many very fine roots; common fine and medium tubular pores; many thin clay films on faces of peds; 6 percent basalt pebbles; strongly effervescent; mildly alkaline; clear wavy boundary.

B3ca—36 to 60 inches; light brown (7.5YR 6/4) clay loam, brown (7.5YR 5/4) moist; weak coarse subangular blocky structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and slightly plastic; common very fine roots; many fine and medium tubular pores; very few thin clay films on faces of peds; 5 percent basalt pebbles; violently effervescent; 15 percent calcium carbonate equivalent; coatings of calcium carbonate on undersides of rock fragments; moderately alkaline.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The B2t horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 3 or 4 when dry or moist. It is clay, silty clay, clay loam, or silty clay loam.

Tricon Series

The soils in the Tricon series are classified as fine, mixed, mesic Petrocalcic Paleustolls. These moderately deep, well drained soils formed in old alluvium and eolian sediment derived mainly from local sources. They are on uplands. Slope is 0 to 5 percent. Elevation is 5,500 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Tricon silt loam in an area of Crews-Tricon association, undulating; about 5.5 miles north of Watrous, along Interstate 25; in the northwest corner of sec. 27, T. 19 N., R. 20 E.; in the Mora Land Grant.

A1—0 to 4 inches; brown (7.5YR 5/2) silt loam, dark brown (7.5YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; common fine tubular pores; neutral; clear wavy boundary.

B21t—4 to 13 inches; brown (7.5YR 5/2) heavy clay loam, dark brown (7.5YR 3/2) moist; weak medium prismatic structure parting to weak medium subangular blocky; slightly hard, friable, slightly sticky and plastic; many very fine and fine roots; many fine tubular pores; few thin clay films on faces of peds; neutral; clear wavy boundary.

B22t—13 to 28 inches; brown (7.5YR 5/4) heavy clay loam, dark brown (7.5YR 4/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, slightly sticky and plastic; common very fine and fine roots; many fine tubular pores; few moderately thick clay films on faces of peds; slightly effervescent; neutral; clear wavy boundary.

Cca—28 to 40 inches; pink (7.5YR 8/4) gravelly clay loam, light brown (7.5YR 6/4) moist; massive; soft, very friable, slightly sticky and nonplastic; 20 percent caliche pebbles; slightly effervescent, 10 percent calcium carbonate equivalent; neutral; abrupt wavy boundary.

Ccam—40 inches; white indurated caliche that is laminar and continuous.

Thickness of the solum and depth to the petrocalcic horizon range from 20 to 40 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist. It is loam or silt loam.

The B horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It is heavy clay loam or heavy silty clay loam.

The Cca horizon has hue of 10YR or 7.5YR, value of 6 to 8 when dry and 4 to 6 when moist, and chroma of 3 to 5 when dry or moist. It is clay loam, loam, or gravelly clay loam and is 0 to 20 percent pebbles.

Tuloso Series

The soils in the Tuloso series are classified as loamy-skeletal, mixed, mesic Lithic Ustochrepts. These shallow, well drained soils formed in residuum and local sediment derived mainly from sandstone. They are on upland benches and canyonsides and along ridges. Slope is 5 to 35 percent. Elevation is 5,500 to 7,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of a Tuloso very stony sandy loam in an area of Sombordoro-Rock outcrop-Tuloso complex, very steep; about 20 miles southeast of Wagon Mound, along New Mexico Highway 271; in the SW1/4NW1/4 of sec. 32, T. 8 N., R. 24 E.

A1—0 to 4 inches; brown (10YR 4/3) very stony sandy loam, dark brown (10YR 3/3) moist; weak very fine platy structure; loose, very friable, nonsticky and nonplastic; many very fine and fine roots; 10 percent pebbles, 15 percent cobbles, and 15 percent stones; moderately alkaline; clear smooth boundary.

B2—4 to 10 inches; brown (7.5YR 4/4) very stony loam, dark brown (7.5YR 3/4) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine roots and many very fine roots; common fine tubular pores; 15 percent pebbles, 20 percent cobbles, and 20 percent stones; moderately alkaline; abrupt wavy boundary.

R—10 inches; hard, red sandstone.

Thickness of the solum and depth to bedrock range from 10 to 20 inches. The profile is 40 to 60 percent rock fragments.

The A horizon has hue of 7.5YR or 10YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4 when dry or moist. It is very stony sandy loam or very stony loam.

The B horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry and 3 or 4 when moist, and chroma of 3 or 4 when dry or moist.

Ustifluvents

Ustifluvents are extremely variable in their characteristics. These soils formed in mixed alluvial material. They are on flood plains along major drainageways. Slope is 0 to 2 percent. Elevation is 5,500 to 8,500 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 44 to 52 degrees F, and the frost-free period is 90 to 160 days.

Sample pedon of Ustifluvents, frequently flooded; about 0.5 mile southeast of North Carmen, along Rito Cebolla; in the southeast corner of the SW1/4 of sec. 2, T. 19 N., R. 15 E.; in the Mora Land Grant.

A11—0 to 4 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 4/3) moist; moderate medium granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; neutral; abrupt smooth boundary.

A12—4 to 12 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; weak medium subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many fine interstitial pores; neutral; clear smooth boundary.

AC—12 to 26 inches; brown (10YR 4/3) loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; many fine interstitial pores; mildly alkaline; gradual smooth boundary.

Ab—26 to 35 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium granular structure; hard, very friable, sticky and plastic; few very fine and fine roots; many fine tubular pores; mildly alkaline; clear smooth boundary.

C—35 to 60 inches; brown (10YR 5/3) loam, dark brown (10YR 4/3) moist; massive; slightly hard, loose, slightly sticky and slightly plastic; few very fine and fine roots; mildly alkaline.

The profile is 30 to 60 inches thick. Many pedons have a buried A horizon that varies in depth and texture.

The A horizon has hue of 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 3 to 6 when dry and 2 to 5 when moist, and chroma of 1 to 6 when dry or moist. It is 0 to 60 percent rock fragments.

The AC horizon has hue of 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 3 to 7 when dry and 2 to 6 when moist, and chroma of 2 to 6 when dry or moist. It ranges from loamy sand to clay and is 0 to 80 percent rock fragments. This horizon commonly is stratified.

The C horizon has hue of 5YR, 7.5YR, 10YR, 2.5Y, or 5Y, value of 3 to 8 when dry and 2 to 7 when moist, and chroma of 1 to 8 when dry or moist. It ranges from sand to clay and is 0 to 85 percent rock fragments.

Vamer Series

The soils in the Vamer series are classified as clayey, mixed Lithic Eutroboralfs. These shallow, well drained soils formed in old sediment derived mainly from sandstone and shale. They are on ridges, mesas, benches, and mountainsides. Slope is 5 to 40 percent. Elevation is 7,200 to 9,000 feet. The average annual precipitation is 16 to 24 inches, the average annual air temperature is 40 to 46 degrees F, and the frost-free period is 85 to 110 days.

Typical pedon of a Vamer stony loam in an area of Dargol-Rocio-Vamer association, very steep; halfway up the south side of Rito Morphy, about 2 miles west of Ledoux; in the southwest corner of the NW1/4 of sec. 29, T. 20 N., R. 15 E.; in the Mora Land Grant.

O—1 inch to 0; forest litter.

A1—0 to 3 inches; dark grayish brown (10YR 4/2) stony loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; loose, very friable, slightly sticky and slightly plastic; many fine and medium roots; many fine interstitial pores; 10 percent stones and 10 percent cobbles; neutral; clear smooth boundary.

B1t—3 to 7 inches; brown (10YR 5/3) clay loam, dark brown (10YR 4/3) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; many fine and medium roots; many very fine, fine, and medium tubular pores; very few thin clay films on faces of peds; 10 percent cobbles; neutral; clear wavy boundary.

B2t—7 to 16 inches; light yellowish brown (10YR 6/4) clay, dark yellowish brown (10YR 4/4) moist; strong medium and coarse subangular blocky structure; hard, firm, very sticky and very plastic; common fine and medium roots; common very fine and fine tubular pores; many thin clay films and few dark blotches on faces of peds; 10 percent cobbles; neutral; abrupt wavy boundary.

R—16 inches; hard brownish sandstone.

Depth to bedrock ranges from 7 to 20 inches.

The A horizon has hue of 10YR or 7.5YR, value of 4 or 5 when dry and 2 to 4 when moist, and chroma of 2 or 3 when dry or moist. It is stony loam or cobbly loam.

The B horizon has hue of 10YR or 7.5YR, value of 5 or 6 when dry and 3 or 4 when moist, and chroma of 3 or 4 when dry or moist. It is clay loam or clay and is more than 35 percent clay.

Vermejo Series

The soils in the Vermejo series are classified as fine, mixed (calcareous), mesic Ustic Torriorthents. These deep, moderately well drained soils formed in fine textured alluvial deposits derived mainly from shale. They are in wide, flat drainageways, on valley floors, and on the bottom of old dry lakebeds. Slope is 0 to 3 percent. Elevation is 5,800 to 7,200 feet. The average annual precipitation is 14 to 18 inches, the average annual air temperature is 48 to 52 degrees F, and the frost-free period is 140 to 160 days.

Typical pedon of Vermejo silty clay loam, 0 to 3 percent slopes; about 12 half miles northeast of Wagon Mound; in the north half of sec. 5, T. 21 N., R. 23 E.

A1—0 to 2 inches; grayish brown (2.5Y 5/2) silty clay loam, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; hard, firm, sticky and plastic; many very fine and fine roots; few fine interstitial pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

AC—2 to 10 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; moderate fine granular structure; hard, firm, sticky and plastic; many very fine and fine roots; few fine interstitial pores; strongly effervescent; moderately alkaline; abrupt smooth boundary.

C1—10 to 22 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; weak coarse prismatic structure parting to moderate medium subangular blocky; very hard, very firm, very sticky and very plastic; common fine roots; few fine tubular pores; few fine mycelia and crystals of salt; violently effervescent; moderately alkaline; clear wavy boundary.

C2—22 to 60 inches; grayish brown (2.5Y 5/2) clay, dark grayish brown (2.5Y 4/2) moist; massive; very hard, very firm, very sticky and very plastic; few fine roots in upper part; few fine mycelia and crystals of salt; violently effervescent; moderately alkaline.

The profile is slightly saline to moderately saline. Most pedons have visible salt crystals at the surface and extending to a depth of 22 inches.

The A and AC horizons have hue of 10YR or 2.5Y, value of 5 or 6 when dry, and chroma of 1 to 3 when dry or moist.

The C horizon has hue of 10YR or 2.5Y, value of 5 or 6 when dry and 4 or 5 when moist, and chroma of 1 to 3 when dry or moist. Calcium carbonate content ranges from 5 to 14 percent.

Yankee Series

The soils in the Yankee series are classified as fine, mixed Vertic Argiborolls. These deep, well drained soils formed in alluvium derived mainly from basalt and modified with eolian material. They are on mesas, valley sides, and side slopes in areas of basalt flows. Slope is 0 to 9 percent. Elevation is 7,400 to 9,000 feet. The average annual precipitation is 16 to 20 inches, the average annual air temperature is 41 to 46 degrees F, and the frost-free period is 85 to 110 days.

Typical pedon of a Yankee loam in an area of Barela-Yankee association, gently sloping; about 8.5 miles south of Ocate, along New Mexico Highway 21, and 1 mile east along Ranch Road; in the NE1/4N1/2 of sec. 2, T. 21 N., R. 17 E.; in the Mora Land Grant.

A11—0 to 4 inches; dark grayish brown (10YR 4/2) loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; neutral; clear smooth boundary.

A12—4 to 12 inches; brown (7.5YR 4/2) heavy loam, dark brown (7.5YR 3/2) moist; weak medium subangular blocky structure parting to moderate fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many fine interstitial pores; neutral; clear smooth boundary.

B21t—12 to 18 inches; reddish brown (5YR 5/3) clay loam, dark reddish brown (5YR 3/3) moist; weak medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; many very fine and fine tubular pores; common thin clay films on faces of peds; mildly alkaline, clear smooth boundary.

B22t—18 to 43 inches; reddish brown (5YR 5/4) light silty clay, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to strong medium subangular blocky; hard, firm, sticky and plastic; few fine roots; many fine and very fine and few medium tubular pores; common thin clay films on faces of peds and in pores; mildly alkaline; clear wavy boundary.

B23t—43 to 50 inches; reddish brown (5YR 5/4) silty clay, reddish brown (5YR 4/4) moist; weak coarse prismatic structure parting to strong medium and coarse subangular blocky; hard, firm, very sticky and very plastic; few fine roots; many very fine and fine tubular pores; common thin clay films on faces of peds; 10 percent basalt pebbles; mildly alkaline; clear wavy boundary.

C—50 to 60 inches; reddish brown (5YR 5/4) heavy clay loam, reddish brown (5YR 4/4) moist; massive; hard, firm, sticky and plastic; many very fine and fine tubular pores; 14 percent basalt pebbles; mildly alkaline.

The solum is 40 to 50 inches thick. The mollic epipedon is 16 to 32 inches thick.

The A horizon has hue of 10YR or 7.5YR, value of 3 or 4 when dry and 2 or 3 when moist, and chroma of 2 or 3 when dry or moist.

The B2t horizon has hue of 7.5YR or 5YR, value of 3 to 5 when dry and 3 or 4 when moist, and chroma of 2 to 4 when dry or moist. It ranges from light silty clay to clay loam or silty clay loam.

The C horizon has hue of 5YR or 7.5YR, value of 4 or 5 when dry or moist, and chroma of 3 or 4 when dry or moist.

Factors of Soil Formation

Soil is a natural, three-dimensional body on the earth's surface that is capable of supporting plants. The size and shape of individual bodies of soil are commonly related to the shape and nature of landforms.

Soil is the result of the interaction of five soil-forming factors. These are (1) plants and animals, (2) parent material, (3) relief, (4) climate, and (5) the length of time the factors of soil formation have been operating. The influence of any one of these factors varies from place to place in the survey area, but the interaction of all the factors determines the kind of soil that forms.

The interaction of the five soil-forming factors is very complex, and it is difficult to isolate the effects of any one factor. In the eastern part of the survey area, climate and vegetation are key factors. In the western part, climate, vegetation, and relief are key factors.

Soil formation processes create layers, or horizons, in soils. These layers help to separate similar soils. They are a direct result of the interaction among the five soil-forming factors.

In the following pages, each of the soil-forming factors is discussed separately.

Plants and Animals

Plant and animal life on and in the soil has an effect on soil formation. Plants contribute roots, stems, leaves, and branches to the soil, the many micro-organisms in the soil decompose the plant and animal remains. Insects and burrowing animals mix the soil. Larger animals trample the soil and break up the crusty surface, which allows more moisture to enter the soil. Animals also add organic matter and other nutrients. Man applies fertilizers, soil amendments, and other material to the soil, extracts products from it, and changes it by cultivation and other earth-moving operations.

The influence of man on soil formation in the survey area has been minimal, except in some irrigated and urban areas. Man has depleted some nutrients and added others by combining waste products from livestock operations, green manure crops, commercial fertilizers, and garbage. In some areas the soils have been eroded because of overgrazing and improper tillage; however, in other areas man has protected the soils by contour farming, leaving mulch and stubble on the soils, planting windbreaks, and using proper grazing practices.

The soils in the survey area have formed under two basic types of vegetation. In the central and eastern parts of the survey area, the vegetation is mainly warm-season grasses with a few cool-season grasses. Precipitation is lower, temperatures are warmer, and plant growth is not so vigorous as in the western part of the area. The grass vegetation in these parts of the area has contributed to the development of a dark-colored surface layer in the soils, and many Mollisols have formed here. Examples are soils in the Carnero, Charette, Colmor, Partri, and Swastika series.

In the western part of the survey area, the vegetation is mainly cool-season grasses with a few warm-season grasses and coniferous forests. Precipitation and elevation are higher, and temperatures are cooler. The grasses grow more vigorously and produce more organic matter. The grassed soils in the valleys have a thicker, dark-colored layer, and many Borolls have formed there. Examples are soils in the Barela, Brycan, Moreno, and Yankee series. The forested soils on mountains and foothills have accumulations of undecomposed litter on the surface, and their profile shows evidence of much leaching. Alfisols have formed in these forested areas. Examples are soils in the Dargol, Etoe, Etown, Maes, Rocio, and Spud series.

Parent Material

The parent material in the survey area is considered to originally have been some form of rock. It has become soil through interaction with the other four soil-forming factors. The parent material in the area ranges in age from Precambrian to Holocene (*3*). The numerous kinds of rock and their varying ages have produced many different kinds of soil in the area. The parent material includes metamorphic, igneous, and sedimentary deposits. Many of the soils in the survey area, especially in the eastern part, show evidence of eolian modifications.

The oldest rocks in the survey area are those of the Precambrian Period and are in the western part of the area. These are metamorphic quartz, gneiss, schist, and micaceous rocks (*4*). The principal soils derived from these rocks are Cundiyo and Nambe Variant soils at the higher elevations and Firo soils at the lower elevations above the Mora and Ledoux Valleys.

The second oldest rocks in the survey area are those of the Pennsylvanian Period, and they are also in the western part. These rocks are mainly gray, greenish gray, and red shale with interbedded arkosic sandstone and a few thin strata of gray fossiliferous limestone in some areas. The Etoe, Etown, Fuera, and Maes soils at the higher elevations and the Dargol, Rocio, and Vamer soils at the lower elevations are derived mainly from these rocks. The Sangre de Cristo Formation, northwest of Ocate, formed during the Pennsylvanian Period. It consists of red, purple, and greenish gray shale, siltstone, clay shale, and arkosic sandstone. The Dargol, Fuera, Rocio, and Vamer soils are derived from this material.

In the west-central part of the survey area are red to brown sandstone and shale of the Permian and Triassic Periods. The Dargol, Rocio, and Vamer soils and Eutroboralfs are derived from this material. In the Rainsville area is the Chinle Formation, which consists of red shale and sandstone formed during the Triassic Period. The Remunda and Lavate Variant soils formed in sediment derived from this formation.

In the eastern part of the survey area, along the Canadian River escarpments and along major drainageways leading to the river, rocks of the Jurassic Period are exposed. The main parent material is that of the Morrison Formation, consisting of red, pale red, and greenish gray shale, siltstone, and sandstone. The principle soils derived from this material are the Tuloso and Sombordoro soils and Ustorthents. In the Turkey Mountains, red to brown shale and sandstone of the Jurassic Period are present. The Dargol, Tuloso, Sombordoro, and Vamer soils formed in this material.

Rocks of the Cretaceous Period occupy the most land area in the survey area. Dakota Sandstone, consisting of tan and brown sandstone with some gray clay shale beds, formed during this period. The Bernal, Carnero, and Partri soils are derived from the Dakota Sandstone.

In the northeastern part of the survey area, the other dominant formations of the Cretaceous Period are Carlisle, Graneros, and Pierre Shale interbedded with Greenhorn and Ft. Hays Limestone. The Colmor, Litle, Mion, Swastika, and Vermejo soils are derived from the shale, and the Penrose and Penrose Variant soils are derived from the limestone.

Remnants of the Ogallala Formation laid down during the Pliocene are common in the southern part of the area, on the Las Vegas Plateau. The Crews and Tricon soils formed in eolian and local sediment from the Ogallala Formation.

Basic igneous rock and basalt are the parent material of many soils in the survey area. During the late Tertiary Period, volcanic lava was deposited in the northwest-central part of the survey area. The Barela, Burnac, Dalcan, Raton, Spud, and Yankee soils formed in material derived from this lava. In the north-central part of the area and around Maxson Crater, volcanic lava was deposited during the more recent Quaternary Period. Soils that formed in these areas are those of the Apache, Ayon, Capulin, Charette, Thunderbird, and Torreon series.

The most recent parent material in the area formed during the Quaternary Period and was deposited as alluvium during the Pleistocene and Holocene. The La Brier and Manzano soils and Ustifluvents at the lower elevations and the Brycan, Ceboya, Hesperus, Holman, and Moreno soils at the higher elevations in mountain valleys and along flood plains and bench terraces formed in this material.

Relief

Relief is one of the more visible factors of soil formation. Relief affects soil formation through its influence on drainage, erosion, runoff, plant cover, soil temperature, and precipitation.

Generally, deep soils that have a distinct, well-developed horizon are in the less sloping areas. Runoff is slower on these soils, less erosion occurs, and more water enters and moves through the soil profile, enhancing soil development. Shallower soils generally have less distinct horizons and are in the steeper, more complex areas. Runoff and erosion are more rapid in these areas, and the soils form slowly. In the mountains where long, steep slopes are common, soil material has eroded at the top and accumulated near the bottom. Thus, the shallower soils are near the top of mountainsides and deep alluvial and colluvial soils are near the bottom. The presence of large amounts of plant cover on the mountains also reduces runoff and erosion and enhances soil development.

The aspect, or direction a slope is facing, commonly affects soil formation. This is especially noticeable in the mountains. Steep, north-facing slopes are much colder and support different vegetation than warmer, south-facing slopes that are exposed to more direct sunlight.

Climate

Climate is the major soil-forming factor in the survey area. It affects vegetation, parent material, drainage, precipitation, and soil temperatures. The major elements in climate are temperature, precipitation, and wind velocity. Generally, as elevation increases, temperature decreases and precipitation increases.

Moisture from precipitation enhances chemical reactions and micro-organisms and promotes plant growth. It also moves downward in the soil and carries dissolved material with it. Typical material that is moved downward, or leached, are nutrients such as nitrogen and sulfur, clay minerals, and soluble salts such as calcium sulfate and calcium carbonate.

Soil temperature is also important in soil formation. When a soil is frozen, most soil-forming processes are stopped and little development occurs. This is common in the mountains in the survey area. Temperature also influences the type of plants that will grow on a soil.

Time

Soil formation requires long periods of time to change parent material into soil material capable of growing plants. As this period of time increases, soils become more developed and horizons or layers within the soil become more apparent.

Young soils on flood plains, such as the Holman and Ceboya soils, formed during the Holocene. These soils have undergone little change since they were deposited, and they show minimal evidence of development. Geologic erosion has altered the land surfaces many times in the survey area, and the present landscapes may be very young and different than those in prior geologic times.

The Manzano and Brycan are older soils. They exhibit more horizon development and more leaching of particles in the soil profile. The Tricon and Spud soils are still older. The Tricon soils have very hard caliche layers and a clayey subsoil. This is caused by accumulation of calcium carbonate and clay particles over a long period of time. The Spud soils also have a fine textured subsoil caused by accumulation of clay particles over a long period of time.

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Glossary

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly such soil formed in recent alluvium or on steep rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher), or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3.5
Low	3.5 to 5.0
Moderate	5.0 to 7.5
High	7.5 to 10
Very high	More than 10

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Bedding planes. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.

Bedrock. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.

Bench terrace. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.

Bisequum. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.

Blowout. A shallow depression from which all or most of the soil material has been removed by wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Broad-base terrace. A ridge-type terrace built to control erosion by diverting runoff along the contour at a nonscouring velocity. The terrace is 10 to 20 inches high and 15 to 30 feet wide and has gently sloping sides, a rounded crown, and a dish-shaped channel along the upper side. It may be nearly level or have a grade toward one or both ends.

Calcareous soil. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.

Caliche. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds just beneath the solum, or it is exposed at the surface by erosion.

Capillary water. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.

Catena. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.

Cation. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.

Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity, but is more precise in meaning.

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a fragment.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Coarse fragments. If round, mineral or rock particles 2 millimeters to 25 centimeters (10 inches) in diameter; if flat, mineral or rock particles (flagstone) 15.2 to 38.1 centimeters (6 to 15 inches) long.

Coarse textured soil. Sand or loamy sand.

Cobblestone (or cobble). A rounded or partly rounded fragment of rock 3 to 10 inches (7.5 to 25 centimeters) in diameter.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Complex slope. Irregular or variable slope. Planning or constructing terraces, diversions, and other water-control measures on a complex slope is difficult.

Complex, soil. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.

Compressible (in tables). Excessive decrease in volume of soft soil under load.

Concretions. Grains, pellets, or nodules of various sizes, shapes, and colors consisting of concentrated compounds or cemented soil grains. The composition of most concretions is unlike that of the surrounding soil. Calcium carbonate and iron oxide are common compounds in concretions.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose.—Noncoherent when dry or moist; does not hold together in a mass.

Friable.—When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm.—When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic.—When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky.—When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Hard.—When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft.—When dry, breaks into powder or individual grains under very slight pressure.

Cemented.—Hard; little affected by moistening.

Contour stripcropping (or contour farming). Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Corrosive. High risk of corrosion to uncoated steel or deterioration of concrete.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Deferred grazing. Postponing grazing or arresting grazing for a prescribed period.

Dense layer (in tables). A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Diversion (or diversion terrace). A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained.—Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained.—Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained.—Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained.—Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained.—Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained.—Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. Very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eluviation. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion (geologic). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.

Erosion (accelerated). Erosion much more rapid than geologic erosion, mainly as a result of the activities of man or other animals or of a catastrophe in nature; for example, fire that exposes the surface.

Erosion pavement. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Excess sulfur (in tables). Excessive amount of sulfur in the soil. The sulfur causes extreme acidity if the soil is drained, and the growth of most plants is restricted.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Field moisture capacity. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called *normal field capacity, normal moisture capacity,* or *capillary capacity.*

Fine textured soil. Sandy clay, silty clay, and clay.

First bottom. The normal flood plain of a stream, subject to frequent or occasional flooding.

Flagstone. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 37.5 centimeters) long.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foot slope. The inclined surface at the base of a hill.

Forb. Any herbaceous plant not a grass or a sedge.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Genesis, soil. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.

Gleyed soil. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors and mottles.

Graded stripcropping. Growing crops in strips that grade toward a protected waterway.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock up to 3 inches (2 millimeters to 7.5 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, up to 3 inches (7.5 centimeters) in diameter.

Green manure crop (agronomy). A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon.—An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.

B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons are generally called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.

C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.

R layer.—Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Humus. The well decomposed, more or less stable part of the organic matter in mineral soils.

Hydrologic soil groups. Refers to soils grouped according to their runoff-producing characteristics. The chief consideration is the inherent capacity of soil bare of vegetation to permit infiltration. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff. Soils are assigned to four groups. In group A are soils having a high infiltration rate when thoroughly wet and having a low runoff potential. They are mainly deep, well drained, and sandy or gravelly. In group D, at the other extreme, are soils having a very slow infiltration rate and thus a high runoff potential. They have a claypan or clay layer at or near the surface, have a permanent high water table, or are shallow over nearly impervious bedrock or other material. A soil is assigned to two hydrologic groups if part of the acreage is artificially drained and part is undrained.

Illuviation. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.

Impervious soil. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Infiltration. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.

Infiltration capacity. The maximum rate at which water can infiltrate into a soil under a given set of conditions.

Infiltration rate. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to.075	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—

Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.

Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes.

Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.

Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.

Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.

Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.

Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.

Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.

Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Low strength. The soil is not strong enough to support loads.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Sandy loam and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Muck. Dark colored, finely divided, well decomposed organic soil material. (See Sapric soil material.)

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Narrow-base terrace. A terrace no more than 4 to 8 feet wide at the base. A narrow-base terrace is similar to a broad-base terrace, except for the width of the ridge and channel.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Nutrient, plant. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.

Open space. A relatively undeveloped green or wooded area provided mainly within an urban area to minimize feelings of congested living.

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan*.

Parent material. The unconsolidated organic and mineral material in which soil forms.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percolation. The downward movement of water through the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.20 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management. For example, slope, stoniness, and thickness.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Regolith. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Rill. A steep sided channel resulting from accelerated erosion. A rill is generally a few inches deep and not wide enough to be an obstacle to farm machinery.

Rippable. Bedrock or hardpan can be excavated using a single-tooth ripping attachment mounted on a tractor with a 200-300 draw bar horsepower rating.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Root zone. The part of the soil that can be penetrated by plant roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Saline soil. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Salty water (in tables.) Water that is too salty for consumption by livestock.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and runoff water.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil is generally silty or clayey, is slippery when wet, and is low in productivity.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance.

Slope (in tables). Slope is great enough that special practices are required to insure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 mm in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stone line. A concentration of coarse fragments in a soil. Generally it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Taxadjuncts. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field is generally built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Terrace (geologic). An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Topsoil. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Trace elements. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, are in soils in extremely small amounts. They are essential to plant growth.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial melt water. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Well graded. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.

Wilting point (or permanent wilting point). The moisture content of soil, on an ovendry basis, at which a plant (specifically sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1910-60 at Levy, N. Mex]

Month	Temperature		Precipitation	
	Average daily maximum	Average daily minimum	Average monthly total	Average number of days with 0.10 inch or more precipitation
	°F	°F	In	
January----	46	13	0.52	2
February---	49	16	0.56	1
March------	55	21	0.82	2
April------	65	30	1.22	2
May--------	71	39	2.19	4
June-------	82	47	1.87	4
July-------	84	52	3.06	7
August-----	82	51	3.17	6
September--	78	43	1.68	3
October----	69	32	1.29	3
November---	57	20	0.70	1
December---	47	13	0.43	1
Year-------	65	31	17.50	36

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
AA	Apache-Ayon complex, gently sloping	35,179	3.1
AB	Apache-Rock outcrop complex, moderately sloping	40,059	3.5
AC	Apache-Rock outcrop-Ayon complex, moderately steep	23,181	2.0
AR	Argiustolls-Rock outcrop complex, extremely steep	10,422	0.9
BA	Barela-Yankee association, gently sloping	34,061	3.0
BC	Bernal-Rock outcrop-Carnero complex, moderately sloping	36,399	3.2
Bd	Breece Variant sandy loam, 3 to 8 percent slopes	3,054	0.3
Be	Brycan loam, 1 to 3 percent slopes	3,248	0.3
Bf	Brycan loam, 3 to 8 percent slopes	812	0.1
BH	Burnac-Hillery association, hilly	7,524	0.7
CA	Capulin-Charette-Ayon association, gently sloping	63,291	5.6
Cb	Ceboya silty clay loam, 0 to 1 percent slopes	971	0.1
CC	Charette-Capulin association, gently undulating	22,979	2.0
CD	Colmor loam, undulating	68,680	6.0
Ce	Colmor silt loam, 1 to 3 percent slopes	274	*
CF	Crews-Tricon association, undulating	36,908	3.3
CN	Cundiyo-Nambe Variant association, extremely steep	3,457	0.3
DA	Dalcan-Raton complex, undulating	7,473	0.7
DF	Dargol-Fuera association, hilly	6,812	0.6
DR	Dargol-Rocio-Vamer association, hilly	30,599	2.7
DV	Dargol-Rocio-Vamer association, very steep	24,801	2.2
EE	Etoe-Etown association, very steep	16,268	1.4
ER	Etoe-Rock outcrop-Rubble land complex, extremely steep	4,372	0.4
EV	Eutroboralfs-Rock outcrop-Vamer complex, extremely steep	43,187	3.8
FH	Firo-Hesperus association, hilly	6,060	0.5
FR	Firo-Rock outcrop complex, extremely steep	22,069	1.9
FU	Fuera-Dargol association, very steep	17,146	1.5
HA	Haplustolls-Rock outcrop complex, extremely steep	22,979	2.0
Hb	Hesperus sandy loam, 1 to 3 percent slopes	5,976	0.5
Hc	Hesperus sandy loam, 3 to 8 percent slopes	2,939	0.3
Ho	Holman complex, 3 to 5 percent slopes	3,582	0.3
Ka	Kinesava sandy loam, 3 to 8 percent slopes	450	*
Kb	Kinesava loam, 1 to 3 percent slopes	1,332	0.1
KR	Krakon-Rock outcrop complex, hilly	4,445	0.4
La	La Brier silty clay loam, 0 to 3 percent slopes	12,788	1.1
LM	Litle-Mion association, moderately sloping	25,317	2.2
MA	Maes-Etoe complex, hilly	4,021	0.4
MB	Maes-Etoe complex, extremely steep	6,614	0.6
Mc	Manzano loam, 1 to 3 percent slopes	16,830	1.5
MD	Mion-Litle-Rock outcrop complex, very steep	4,118	0.4
ME	Mion-Litle-Rock outcrop association, very steep	2,237	0.2
MF	Mion-Penrose Variant-Rock outcrop complex, very steep	4,575	0.4
MG	Mion-Penrose Variant-Rock outcrop association, very steep	6,812	0.6
Mh	Moreno loam, 3 to 8 percent slopes	2,092	0.2
Mo	Moreno loam, 8 to 15 percent slopes	636	0.1
MR	Moreno-Brycan association, sloping	19,037	1.7
NR	Nambe Variant-Rock outcrop-Rubble land complex, extremely steep	2,033	0.2
Pa	Partri loam, 1 to 3 percent slopes	3,416	0.3
PB	Partri loam, gently sloping	44,989	4.0
PC	Partri-Carnero-Bernal association, undulating	83,220	7.3
PM	Penrose-Mion-Litle association, moderately sloping	14,336	1.3
PT	Pidineen-Tricon complex, undulating	10,473	0.9
RB	Raton-Barela association, hilly	10,371	0.9
RD	Raton-Dalcan association, hilly	21,555	1.9
RE	Raton-Rock outcrop complex, very steep	12,760	1.1
Rf	Remunda loam, 1 to 3 percent slopes	3,063	0.3
Rh	Remunda clay loam, 0 to 2 percent slopes	848	0.1
RL	Remunda-Lavate Variant association, gently sloping	6,710	0.6
RO	Rock outcrop-Bernal complex, moderately steep	9,100	0.8
SA	Sombordoro-Rock outcrop-Tuloso complex, moderately sloping	32,536	2.9
SB	Sombordoro-Rock outcrop-Tuloso complex, very steep	51,701	4.5
SM	Spud-Burnac association, very steep	12,354	1.1
SW	Swastika silt loam, gently sloping	34,620	3.1
Sx	Swastika silty clay loam, 0 to 3 percent slopes	256	*
TA	Tinaja gravelly loam, moderately steep	3,346	0.3
TT	Torreon-Thunderbird association, gently sloping	20,132	1.8
US	Ustifluvents, frequently flooded	5,259	0.5
VA	Vamer-Rock outcrop-Eutroboralfs complex, hilly	10,778	1.0
Ve	Vermejo silty clay loam, 0 to 3 percent slopes	15,845	1.4
VK	Vermejo-Karde association, gently sloping	4,639	0.4

See footnote at end of table.

TABLE 2.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
YS	Yankee-Saladon association, gently sloping	2,084	0.2
W	Water	1,470	0.1
	Total	1,133,960	100.0

* Less than 0.1 percent.

TABLE 3.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields in the N columns are for nonirrigated soils; those in the I columns are for irrigated soils. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils suited to crops and pasture are listed]

Soil name and map symbol	Annual hay crops		Pasture		Wheat		Corn		Grass hay		Legume hay	
	N	I	N	I	N	I	N	I	N	I	N	I
	Ton	Ton	AUM*	AUM*	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton
Bd--- Breece Variant	---	---	2.0	3.0	---	---	---	---	1.0	1.5	---	---
Be--- Brycan	1.0	1.5	5.0	10.0	20	38	24	50	1.5	2.5	2.0	3.0
Bf--- Brycan	1.0	---	4.0	9.0	18	35	22	45	1.5	2.0	2.0	3.0
Cb--- Cebova	---	---	6.0	12.0	---	---	---	---	1.5	2.0	---	---
Ce--- Colmor	1.0	2.0	4.0	10.0	20	40	22	50	1.0	1.7	1.0	3.5
Hb--- Hesperus	1.0	1.5	4.0	9.0	20	38	24	50	1.5	2.5	2.0	3.0
Hc--- Hesperus	1.0	---	3.0	8.0	18	35	22	45	1.5	2.0	2.0	3.0
Ho**:												
Holman very cobbly---	---	---	2.0	5.0	---	---	---	---	1.0	2.0	---	---
Holman extremely cobbly--	---	---	2.0	4.0	---	---	---	---	1.0	1.5	---	---
Ka--- Kinesava	1.0	---	3.0	8.0	18	35	22	45	1.5	2.0	2.0	3.0
Kb--- Kinesava	1.0	1.5	4.0	9.0	20	38	24	50	1.5	2.5	2.0	2.0
La--- La Brier	1.0	2.0	4.0	9.0	16	35	18	40	1.0	1.5	1.0	3.5
Mc--- Manzano	1.0	2.0	4.0	10.0	15	38	22	50	1.0	1.5	2.5	4.0
Mh--- Moreno	1.0	1.5	5.0	9.0	18	35	22	45	1.5	2.5	2.0	3.0
Mo--- Moreno	---	---	3.0	---	---	---	---	---	1.0	---	---	---
Pa--- Partri	1.0	1.5	4.0	9.0	15	40	15	45	1.0	2.0	1.0	3.5
Rf--- Remunda	1.0	2.0	5.0	12.0	20	50	20	60	1.5	2.0	1.0	3.5
Rh--- Remunda	1.0	2.0	4.5	11.0	18	45	18	55	1.5	2.0	1.0	3.0
Sx--- Swastika	1.0	2.0	4.0	10.0	20	40	22	50	1.0	1.7	1.0	3.5
Ve--- Vermejo	1.0	1.5	4.0	9.0	15	35	15	40	1.0	1.5	1.0	2.5

See footnotes at end of table.

TABLE 3.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Annual hay crops		Pasture		Wheat		Corn		Grass hay		Legume hay	
	N	I	N	I	N	I	N	I	N	I	N	I
	Ton	Ton	AUM*	AUM*	Bu	Bu	Bu	Bu	Ton	Ton	Ton	Ton
YS**:												
Yankee	1.0	---	5.0	---	15	---	22	---	1.5	---	2.0	---
Saladon	---	---	6.0	---	---	---	---	---	1.5	---	---	---

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.

** See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 4.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[Only the soils suitable for production of commercial trees are listed. Absence of an entry indicates that information was not available]

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
BH*:							
Burnac	2x	Moderate	Slight	Severe	Quaking aspen	52	White fir.
					White fir	---	
					Bristlecone pine	---	
					Englemann spruce	---	
Hillery.							
CN*:							
Cundiyo	4x	Severe	Severe	Moderate	Douglas-fir	65	Douglas-fir, white fir.
					White fir	85	
					Engelmann spruce	---	
					Ponderosa pine	---	
					Quaking aspen	---	
					Limber pine	---	
					Gambel oak	---	
Nambe Variant	3f	Severe	Moderate	Moderate	Douglas-fir	50	Douglas-fir.
					Engelmann spruce	50	
					Limber pine	50	
					White fir	---	
					Quaking aspen	---	
					Ponderosa pine	---	
DA*:							
Dalcan	4f	Slight	Slight	Slight	Ponderosa pine	65	Ponderosa pine.
					Douglas-fir	---	
					White fir	---	
					Gambel oak	---	
Raton	4d	Moderate	Moderate	Moderate	Ponderosa pine	65	Ponderosa pine, Douglas-fir.
					Douglas-fir	---	
					White fir	---	
					Quaking aspen	---	
					Gambel oak	---	
DP*:							
Dargol	4x	Severe	Moderate	Moderate	Ponderosa pine	70	Ponderosa pine, Douglas-fir.
					Douglas-fir	---	
					White fir	---	
					Gambel oak	---	
Puera	3o	Moderate	Moderate	Moderate	Douglas-fir	55	Douglas-fir, ponderosa pine.
					Ponderosa pine	---	
					White fir	---	
					Quaking aspen	---	
					Engelmann spruce	---	
					Gambel oak	---	
DR*:							
Dargol	4x	Moderate	Moderate	Moderate	Ponderosa pine	70	Ponderosa pine, Douglas-fir.
					Douglas-fir	---	
					White fir	---	
Rocio	4o	Moderate	Slight	Slight	Ponderosa pine	75	Douglas-fir, ponderosa pine.
					Douglas-fir	---	
					White fir	---	
					Gambel oak	---	
Vamer.							

See footnote at end of table.

TABLE 4.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
DV*:							
Dargol	3r	Severe	Moderate	Moderate	Ponderosa pine Douglas-fir White fir Gambel oak Quaking aspen	58 --- --- --- ---	Ponderosa pine, Douglas-fir.
Rocic	4r	Severe	Moderate	Slight	Ponderosa pine Douglas-fir White fir Gambel oak	72 --- --- ---	Douglas-fir, ponderosa pine.
Vamer.							
EF*:							
Etoe	4f	Severe	Moderate	Moderate	Ponderosa pine Douglas-fir White fir Corkbark fir Quaking aspen Gambel oak	75 65 --- --- --- ---	Douglas-fir, ponderosa pine.
Etown	4f	Severe	Moderate	Moderate	Douglas-fir Ponderosa pine White fir Quaking aspen Gambel oak	70 --- --- --- ---	Douglas-fir.
ER*:							
Etoe	3f	Severe	Moderate	Moderate	Douglas-fir Ponderosa pine White fir Corkbark fir Quaking aspen	60 --- --- --- ---	Douglas-fir, ponderosa pine.
Rock outcrop.							
Rubble land.							
FH*:							
Firo	3d	Severe	Severe	Moderate	Ponderosa pine Douglas-fir White fir Gambel oak	50 --- --- ---	Ponderosa pine, Douglas-fir.
Hesperus	4o	Slight	Slight	Moderate	Ponderosa pine	75	Ponderosa pine, Douglas-fir.
FR*:							
Firo	3d	Severe	Severe	Moderate	Ponderosa pine Douglas-fir White fir Gambel oak	50 --- --- ---	Ponderosa pine, Douglas-fir.
Rock outcrop.							
PU*:							
Puera	3r	Severe	Moderate	Moderate	Douglas-fir Ponderosa pine White fir Quaking aspen Engelmann spruce Gambel oak	60 --- --- --- --- ---	Douglas-fir, ponderosa pine.
Dargol	3x	Severe	Moderate	Moderate	Ponderosa pine	58	Ponderosa pine.

See footnote at end of table.

TABLE 4.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
Ho*:							
Holman	4f	Moderate	Moderate	Slight	Ponderosa pine	74	Ponderosa pine, Douglas-fir.
					Douglas-fir	---	
					Gambel oak	---	
Holman	7f	Moderate	Moderate	Slight	Engelmann spruce	92	Douglas-fir, white fir.
					Douglas-fir	---	
					White fir	---	
					Quaking aspen	---	
					Gambel oak	---	
MA*:							
Maes	4f	Moderate	Moderate	Slight	Douglas-fir	70	Douglas-fir, white fir.
					White fir	---	
					Ponderosa pine	---	
					Quaking aspen	---	
					Engelmann spruce	---	
					Gamble oak	---	
Etoe	5f	Moderate	Moderate	Moderate	Ponderosa pine	80	Ponderosa pine, Douglas-fir, white fir.
					Douglas-fir	70	
					White fir	---	
					Quaking aspen	---	
					Gambel oak	---	
MB*:							
Maes	4f	Severe	Moderate	Slight	Douglas-fir	65	Douglas-fir, white fir.
					White fir	---	
					Ponderosa pine	---	
					Quaking aspen	---	
					Engelmann spruce	---	
					Gambel oak	---	
Etoe	4f	Severe	Moderate	Moderate	Douglas-fir	65	Douglas-fir, ponderosa pine.
					Ponderosa pine	---	
					White fir	---	
NR*:							
Nambe Variant	3x	Severe	Moderate	Moderate	Douglas-fir	50	Douglas-fir.
					Engelmann spruce	50	
					Limber pine	50	
					White fir	---	
					Quaking aspen	---	
					Ponderosa pine	---	
Rock outcrop.							
Rubble land.							
RD*:							
Raton	4d	Moderate	Moderate	Moderate	Ponderosa pine	65	Ponderosa pine, Douglas-fir.
					Douglas-fir	---	
					White fir	---	
					Quaking aspen	---	
					Gambel oak	---	
Dalcan	4x	Slight	Slight	Slight	Ponderosa pine	65	Ponderosa pine.
RE*:							
Raton	4x	Moderate	Moderate	Moderate	Douglas-fir	73	Douglas-fir, white fir.
					White fir	---	
					Ponderosa pine	---	
					Limber pine	---	
					Quaking aspen	---	
Rock outcrop.							

See footnote at end of table.

TABLE 4.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Management concerns			Potential productivity		Trees to plant
		Equipment limitation	Seedling mortality	Plant competition	Common trees	Site index	
SA*, SB*:							
Sombordoro---------	2x	Moderate	Severe	Moderate	Oneseed juniper----- Pinyon--------------	85 ---	
Rock outcrop.							
Tuloso-------------	2x	Moderate	Moderate	Moderate	Pinyon-------------- Oneseed juniper-----	90 ---	
SM*:							
Spud---------------	4x	Severe	Moderate	Moderate	Douglas-fir--------- Ponderosa pine------ White fir----------- Limber pine--------- Gambel oak----------	70 --- --- --- ---	Douglas-fir, ponderosa pine.
Burnac-------------	4x	Severe	Moderate	Moderate	Douglas-fir--------- White fir----------- Ponderosa pine------	68 --- ---	Douglas-fir.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 5.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
AA*:					
Apache	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, depth to rock.	Moderate: large stones.	Severe: large stones, thin layer.
Ayon	Moderate: dusty.	Moderate: dusty.	Moderate: large stones, slope, dusty.	Moderate: dusty.	Moderate: large stones.
AB*:					
Apache	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones.	Severe: large stones, thin layer.
Rock outcrop.					
AC*:					
Apache	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones.	Severe: large stones, thin layer.
Rock outcrop.					
Ayon	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: large stones.	Severe: slope, large stones.
AR*:					
Argiustolls.					
Rock outcrop.					
BA*:					
Barela	Slight	Slight	Severe: slope.	Slight	Moderate: large stones.
Yankee	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
BC*:					
Bernal	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
Rock outcrop.					
Carnero	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, depth to rock.	Moderate: dusty.	Moderate: thin layer.
Bd Breece Variant	Slight	Slight	Moderate: slope.	Slight	Slight.
Be, Bf Brycan	Slight	Slight	Moderate: slope.	Slight	Slight.
BH*:					
Burnac	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: large stones, slope.	Severe: slope.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
BH*: Hillery	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
CA*: Capulin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Moderate: large stones.
Charette	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Severe: erodes easily.	Slight.
Ayon	Moderate: dusty.	Moderate: dusty.	Moderate: large stones, slope, dusty.	Moderate: dusty.	Moderate: large stones.
Cb Ceboya	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness, flooding.	Severe: wetness, erodes easily.	Severe: wetness, flooding.
CC*: Charette	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Severe: erodes easily.	Slight.
Capulin	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Moderate: large stones.
CD*, Ce Colmor	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
CF*: Crews	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.
Tricon	Slight	Slight	Moderate: slope, cemented pan.	Slight	Moderate: thin layer.
CN*: Cundiyo	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: large stones, slope.	Severe: large stones, slope.
Nambe Variant	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: large stones, droughty, slope.
DA*: Dalcan	Moderate: large stones, small stones.	Moderate: large stones, small stones.	Severe: large stones, small stones.	Moderate: large stones.	Severe: large stones.
Raton	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones.	Severe: large stones, thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
DP*:					
Dargol	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Puera	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope.
DR*:					
Dargol	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Rocio	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Vamer	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
DV*:					
Dargol	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Rocio	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Vamer	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
EE*:					
Etoe	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Etown	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
ER*:					
Etoe	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Rock outcrop.					
Rubble land.					
EV*:					
Eutroboralfs.					
Rock outcrop.					
Vamer	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
FH*:					
Firo	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope.	Moderate: large stones, slope.	Severe: large stones, slope, thin layer.
Hesperus	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
FR*:					
Firo	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.					
FU*:					
Fuera	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Severe: slope.	Severe: large stones, slope.
Dargol	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
HA*:					
Haplustolls.					
Rock outcrop.					
Hb, Hc Hesperus	Slight	Slight	Moderate: slope, small stones.	Slight	Slight.
Ho*:					
Holman	Severe: flooding, large stones.	Severe: large stones.	Severe: large stones, small stones.	Moderate: large stones.	Severe: large stones, droughty.
Holman	Severe: flooding, large stones.	Severe: large stones.	Severe: large stones, small stones.	Severe: large stones.	Severe: large stones, droughty.
Ka Kinesava	Slight	Slight	Moderate: slope.	Slight	Slight.
Kb Kinesava	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
KR*:					
Krakon	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Rock outcrop.					
La La Brier	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.
LM*:					
Litle	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
Mion	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MA*:					
Maes	Severe: slope.	Severe: slope.	Severe: large stones, slope.	Moderate: slope.	Severe: slope.
Etoe	Severe: slope, small stones.	Severe: slope, small stones.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: small stones, slope.
MB*:					
Maes	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: large stones, slope.
Etoe	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope.
Mc Manzano	Severe: flooding.	Slight	Moderate: slope.	Slight	Slight.
MD*:					
Mion	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, small stones.	Moderate: large stones, slope.	Severe: small stones, slope, thin layer.
Litle	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
Rock outcrop.					
ME*:					
Mion	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Moderate: slope.	Severe: slope, thin layer.
Litle	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
Rock outcrop.					
MF*:					
Mion	Severe: slope, large stones, depth to rock.	Severe: slope, large stones, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: small stones, slope, thin layer.
Penrose Variant	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: large stones, slope.	Severe: slope, thin layer.
Rock outcrop.					
MG*:					
Mion	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
MG*: Penrose Variant	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Rock outcrop.					
Mh Moreno	Slight	Slight	Moderate: slope.	Slight	Moderate: large stones.
Mo Moreno	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
MR*: Moreno	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: large stones, slope.
Brycan	Slight	Slight	Moderate: slope.	Slight	Slight.
NR*: Nambe Variant	Severe: slope.	Severe: slope.	Severe: large stones, slope, small stones.	Severe: slope.	Severe: large stones, droughty, slope.
Rock outcrop.					
Rubble land.					
Pa, PB* Partri	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
PC*: Partri	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
Carnero	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, depth to rock.	Moderate: dusty.	Moderate: thin layer.
Bernal	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Slight	Severe: thin layer.
PM*: Penrose	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock, slope.	Moderate: dusty.	Severe: thin layer.
Mion	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, small stones.	Slight	Severe: thin layer.
Litle	Moderate: percs slowly.	Moderate: percs slowly.	Severe: slope.	Severe: erodes easily.	Moderate: thin layer.
PT*: Pidineen	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Slight	Severe: thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
PT*: Tricon	Slight	Slight	Moderate: slope, cemented pan.	Slight	Moderate: thin layer.
RB*: Raton	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones.	Severe: large stones, slope, thin layer.
Barela	Slight	Slight	Severe: slope.	Slight	Moderate: large stones.
RD*: Raton	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones.	Severe: large stones, slope, thin layer.
Dalcan	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: large stones.	Severe: large stones.
RE*: Raton	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope.	Severe: large stones, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.					
Rf Remunda	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Rh Remunda	Slight	Slight	Slight	Slight	Slight.
RL*: Remunda	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Moderate: dusty.	Slight.
Lavate Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight	Slight.
RO*: Rock outcrop.					
Bernal	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: large stones, slope.	Severe: large stones, slope, thin layer.
SA*: Sombordoro	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones, erodes easily.	Severe: large stones, thin layer.
Rock outcrop.					
Tuloso	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, slope, depth to rock.	Moderate: large stones.	Severe: large stones, thin layer.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
SB*:					
Sombordoro	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: large stones, slope, erodes easily.	Severe: large stones, slope, thin layer.
Rock outcrop.					
Tuloso	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: large stones, slope, depth to rock.	Severe: slope.	Severe: large stones, slope, thin layer.
SM*:					
Spud	Severe: slope, percs slowly.	Severe: slope, percs slowly.	Severe: large stones, slope, small stones.	Severe: large stones, slope.	Severe: large stones, slope.
Burnac	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
SW* Swastika	Moderate: dusty.	Moderate: dusty.	Moderate: slope, dusty.	Severe: erodes easily.	Slight.
Sx Swastika	Slight	Slight	Slight	Severe: erodes easily.	Slight.
TA* Tinaja	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: droughty, slope.
TT*:					
Torreon	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
Thunderbird	Moderate: large stones, percs slowly.	Moderate: large stones, percs slowly.	Severe: large stones.	Moderate: large stones.	Moderate: large stones, thin layer.
US. Ustifluvents					
VA*:					
Vamer	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Rock outcrop.					
Eutroboralfs.					
Ve Vermejo	Severe: flooding, excess salt.	Severe: excess salt.	Severe: excess salt.	Slight	Severe: excess salt.
VK*:					
Vermejo	Severe: flooding, excess salt.	Severe: excess salt.	Severe: excess salt.	Slight	Severe: excess salt.
Karde	Moderate: excess salt.	Moderate: excess salt.	Moderate: slope, excess salt.	Slight	Moderate: excess salt.

See footnote at end of table.

TABLE 5.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
YS*:					
Yankee	Slight	Slight	Moderate: slope.	Severe: erodes easily.	Slight.
Saladon	Severe: flooding, wetness, percs slowly.	Severe: wetness, excess humus.	Severe: excess humus, wetness.	Severe: wetness, excess humus.	Severe: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 6.--WILDLIFE HABITAT POTENTIALS

[See text for definitions of "good," "fair," "poor," and "very poor." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
AA*:											
Apache	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Ayon	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair.
AB*:											
Apache	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											
AC*:											
Apache	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											
Ayon	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair.
AR*:											
Argiustolls.											
Rock outcrop.											
BA*:											
Barela	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Yankee	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
BC*:											
Bernal	Poor	Poor	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											
Carnero	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
Bd Breece Variant	Poor	Poor	Fair	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Be, Bf Brycan	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
BH*:											
Burnac	Very poor.	Very poor.	Good	Good	Good	Poor	Poor	Poor	Fair	Poor	---
Hillery	Poor	Fair	Good	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
CA*:											
Capulin	Fair	Good	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Fair.
Charette	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
CA*:											
Ayon	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	Very poor.	Very poor.	Fair.
Cb Ceboya	Very poor.	Poor	Good	---	Poor	Good	Good	Poor	---	Good	Fair.
CC*:											
Charette	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Capulin	Fair	Good	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Fair.
CD* Colmor	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Ce Colmor	Good	Good	Fair	---	Fair	Good	Poor	Good	---	Poor	Fair.
CP*:											
Crews	Poor	Poor	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Tricon	Poor	Poor	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Fair.
CN*:											
Cundiyo	Very poor.	Very poor.	Good	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Nambe Variant	Very poor.	Very poor.	Good	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
DA*:											
Dalcan	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Raton	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
DP*:											
Dargol	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Puera	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
DR*, DV*:											
Dargol	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Rocio	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	Very poor.
Vamer	Poor	Poor	Fair	Fair	Fair	Very poor.	Poor	Poor	Fair	Very poor.	Fair.
EE*:											
Etoe	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Etown	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
ER*:											
Etoe	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Rock outcrop.											
Rubble land.											
EV*:											
Eutroboralfs.											
Rock outcrop.											
Vamer	Poor	Poor	Fair	Fair	Fair	Very poor.	Poor	Poor	Fair	Very poor.	Fair.
FH*:											
Firo	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Hesperus	Poor	Fair	Good	---	Good	Very poor.	Very poor.	Fair	---	Very poor.	Good.
FR*:											
Firo	Very poor.	Very poor.	Fair	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
Rock outcrop.											
FU*:											
Fuera	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Dargol	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
HA*:											
Haplustolls.											
Rock outcrop.											
Hb, Hc Hesperus	Fair	Fair	Good	---	Good	Poor	Very poor.	Fair	---	Very poor.	Good.
Ho*:											
Holman	Poor	Poor	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Holman	Poor	Poor	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
Ka, Kb Kinesava	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
KR*:											
Krakon	Very poor.	Very poor.	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											
La La Brier	Fair	Good	Fair	---	Poor	Good	Fair	Fair	---	Fair	Poor.
LM*:											
Litle	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Fair.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
LM*:											
Mion	Very poor.	Very poor.	Fair	---	Fair	Poor	Poor	Poor	---	Poor	Fair.
MA*:											
Maes	Poor	Poor	Good	Fair	Fair	Very poor.	Very poor.	Fair	Fair	Very poor.	---
Etoe	Poor	Poor	Good	Good	Good	Very poor.	Very poor.	Fair	Fair	Very poor.	---
MB*:											
Maes	Very poor.	Very poor.	Good	Fair	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Etoe	Very poor.	Very poor.	Good	Good	Good	Very poor.	Very poor.	Poor	Fair	Very poor.	---
M Manzano	Good	Good	Good	---	Fair	Fair	Fair	Good	---	Fair	Fair.
MD*, ME*:											
Mion	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Litle	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Fair.
Rock outcrop.											
MF*, MG*:											
Mion	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Penrose Variant	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Fair.
Rock outcrop.											
Mh, Mo Moreno	Poor	Fair	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
MR*:											
Moreno	Poor	Fair	Good	---	Fair	Very poor.	Very poor.	Fair	---	Very poor.	Fair.
Brycan	Poor	Fair	Good	Good	Good	Very poor.	Very poor.	Fair	Good	Very poor.	Good.
NR*:											
Nambe Variant	Very poor.	Very poor.	Good	Fair	---	Very poor.	Very poor.	Poor	Fair	Very poor.	---
Rock outcrop.											
Rubble land.											
Pa Partri	Good	Good	Fair	---	Fair	Poor	Poor	Fair	---	Poor	---
PB* Partri	Poor	Fair	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.
PC*:											
Partri	Poor	Fair	Poor	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Poor.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for—			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
PC*:											
Carnero-----------	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
Bernal------------	Poor	Poor	Fair	---	Poor	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
PM*:											
Penrose.											
Mion--------------	Poor	Poor	Fair	Poor	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Litle-------------	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Fair.
PT*:											
Pidineen----------	Very poor.	Very poor.	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Tricon------------	Poor	Poor	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Fair.
RB*:											
Raton-------------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Barela------------	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
RD*:											
Raton-------------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Dalcan------------	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Fair	Very poor.	Fair.
RE*:											
Raton-------------	Very poor.	Very poor.	Fair	---	Fair	Very poor.	Very poor.	Poor	---	Very poor.	Fair.
Rock outcrop.											
Rf, Rh------------- Remunda	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Poor	Poor.
RL*:											
Remunda-----------	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Poor	Poor.
Lavate Variant----	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Fair	---	Very poor.	Poor.
RO*:											
Rock outcrop.											
Bernal------------	Very poor.	Very poor.	Poor	---	Poor	Very poor.	Very poor.	Very poor.	---	Very poor.	Poor.
SA*, SB*:											
Sombordoro--------	Very poor.	Very poor.	Fair	Poor	Fair	Very poor.	Very poor.	Poor	Poor	Very poor.	Fair.
Rock outcrop.											
Tuloso------------	Very poor.	Very poor.	Poor	Very poor.	Poor	Very poor.	Very poor.	Very poor.	Very poor.	Very poor.	Poor.

See footnote at end of table.

TABLE 6.--WILDLIFE HABITAT POTENTIALS--Continued

Soil name and map symbol	Potential for habitat elements							Potential as habitat for--			
	Grain and seed crops	Grasses and legumes	Wild herbaceous plants	Coniferous plants	Shrubs	Wetland plants	Shallow water areas	Openland wildlife	Woodland wildlife	Wetland wildlife	Rangeland wildlife
SM*: Spud	Very poor.	Very poor.	Good	Good	Fair	Poor	Very poor.	Poor	Fair	Very poor.	Fair.
Burnac	Very poor.	Very poor.	Good	Good	Good	Poor	Poor	Poor	Fair	Poor	---
SW* Swastika	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Poor	---	Very poor.	Fair.
Sx Swastika	Good	Good	Fair	---	Fair	Poor	Poor	Fair	---	Poor	---
TA* Timaja	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
TT*: Torreon	Poor	Fair	Fair	---	Poor	Poor	Very poor.	Poor	---	Very poor.	Fair.
Thunderbird	Poor	Poor	Fair	Good	Fair	Very poor.	Very poor.	Poor	Good	Very poor.	Fair.
US. Ustifluvents											
VA*: Vamer	Poor	Poor	Fair	Fair	Fair	Very poor.	Poor	Poor	Fair	Very poor.	Fair.
Rock outcrop.											
Eutroboralfs.											
Ve Vermejo	Fair	Good	Fair	---	Poor	Good	Good	Fair	---	Good	---
VK*: Vermejo	Poor	Poor	Fair	---	Poor	Poor	Poor	Poor	---	Poor	Poor.
Karde	Poor	Fair	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
YS*: Yankee	Fair	Good	Fair	---	Fair	Poor	Very poor.	Fair	---	Very poor.	Fair.
Saladon	Poor	Poor	Good	---	Poor	Good	Good	Poor	---	Good	Fair.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 7.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
AA*:						
Apache	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: large stones, thin layer.
Ayon	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Moderate: large stones.
AB*:						
Apache	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.
Rock outcrop.						
AC*:						
Apache	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: large stones, thin layer.
Rock outcrop.						
Ayon	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.
AR*:						
Argiustolls.						
Rock outcrop.						
BA*:						
Barela	Moderate: depth to rock, too clayey, large stones.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: large stones.
Yankee	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
BC*:						
Bernal	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Rock outcrop.						
Carnero	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
Bd Breece Variant	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Be Brycan	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Bf Brycan	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
BH*: Burnac	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Hillery	Moderate: depth to rock, too clayey, large stones.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: large stones, slope.
CA*: Capulin	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, slope, large stones.	Severe: low strength.	Moderate: large stones.
Charette	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Ayon	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Severe: large stones.	Moderate: large stones.
Cb Ceboya	Severe: wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.
CC*: Charette	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
Capulin	Moderate: large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Moderate: shrink-swell, large stones.	Severe: low strength.	Moderate: large stones.
CD*, Ce Colmor	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
CP*: Crews	Severe: cemented pan.	Severe: shrink-swell, cemented pan.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell, cemented pan.	Severe: cemented pan, low strength, shrink-swell.	Severe: thin layer.
Tricon	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
CN*: Cundiyo	Severe: cutbanks cave, large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
Nambe Variant	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, droughty, slope.
DA*: Dalcan	Severe: depth to rock, large stones.	Severe: large stones.	Severe: depth to rock, large stones.	Severe: large stones.	Severe: low strength, large stones.	Severe: large stones.
Raton	Severe: depth to rock, large stones.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, low strength.	Severe: large stones, thin layer.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
DF*:						
Dargol-----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Puera------------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: large stones, slope.
DR*:						
Dargol-----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Rocio------------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Vamer------------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
DV*:						
Dargol-----------	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Rocio------------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Vamer------------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
EE*:						
Etoe-------------	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Etown------------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
ER*:						
Etoe-------------	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Rock outcrop.						
Rubble land.						
EV*:						
Eutroboralfs.						
Rock outcrop.						
Vamer------------	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PH*:						
Piro	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
Hesperus	Moderate: slope.	Moderate: slope.	Moderate: slope.	Severe: slope.	Moderate: slope, frost action.	Moderate: slope.
PR*:						
Piro	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
Rock outcrop.						
PU*:						
Puera	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: large stones, slope.
Dargol	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
HA*:						
Haplustolls.						
Rock outcrop.						
Hb Hesperus	Slight	Slight	Slight	Slight	Moderate: frost action.	Slight.
Hc Hesperus	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
Ho*:						
Holman	Severe: cutbanks cave, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: large stones.	Severe: large stones, droughty.
Holman	Severe: cutbanks cave, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: flooding, large stones.	Severe: large stones.	Severe: large stones, droughty.
Ka Kinesava	Moderate: depth to rock, too clayey.	Slight	Moderate: depth to rock.	Moderate: slope.	Moderate: frost action.	Slight.
Kb Kinesava	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, frost action.	Slight.
KR*:						
Krakon	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.						
La La Brier	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
LM*:						
Litle	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
Mion	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: thin layer.
MA*:						
Maes	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Etoe	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: small stones, slope.
MB*:						
Maes	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, slope.
Etoe	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.
Mc Manzano	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.	Slight.
MD*:						
Mion	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: small stones, slope, thin layer.
Litle	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
Rock outcrop.						
ME*:						
Mion	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, thin layer.
Litle	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe. shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
Rock outcrop.						
MF*:						
Mion	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: small stones, slope, thin layer.
Penrose Variant	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.						

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
MG*: Mion	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope, thin layer.
Penrose Variant	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.						
Mn Moreno	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Severe: low strength.	Moderate: large stones.
Mo Moreno	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
MR*: Moreno	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: large stones, slope.
Brycan	Slight	Slight	Slight	Moderate: slope.	Moderate: frost action.	Slight.
NB*: Nambe Variant	Severe: large stones, slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: large stones, droughty, slope.
Rock outcrop.						
Rubble land.						
Pa, PB* Partri	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
PC*: Partri	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Carnero	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
Bernal	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: thin layer.
PM*: Penrose	Severe: depth to rock.	Moderate: slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope.	Severe: thin layer.
Mion	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Severe: thin layer.
Litle	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
PT*: Pidineen	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: thin layer.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
PT*: Tricon	Severe: cemented pan.	Severe: shrink-swell.	Severe: cemented pan, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
RB*: Raton	Severe: depth to rock, large stones, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
Barela	Moderate: depth to rock, too clayey, large stones.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: large stones.
RD*: Raton	Severe: depth to rock, large stones, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
Dalcan	Severe: depth to rock, large stones.	Severe: large stones.	Severe: depth to rock, large stones.	Severe: slope, large stones.	Severe: low strength, large stones.	Severe: large stones.
RE*: Raton	Severe: depth to rock, large stones, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.						
Rf, Rh Remunda	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
RL*: Remunda	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Lavate Variant	Slight	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: frost action, shrink-swell.	Slight.
RO*: Rock outcrop.						
Bernal	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: large stones, slope, thin layer.
SA*: Sombordoro	Severe: depth to rock, large stones.	Severe: shrink-swell, depth to rock.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength.	Severe: large stones, thin layer.
Rock outcrop.						
Tuloso	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: large stones, thin layer.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
SB*: Sombordoro	Severe: depth to rock, large stones, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: large stones, slope, thin layer.
Rock outcrop.						
Tuloso	Severe: depth to rock, large stones, slope.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: slope, depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: large stones, slope, thin layer.
SN*: Spud	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: large stones, slope.
Burnac	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
SW*, Sx Swastika	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
TA* Tinaja	Severe: cutbanks cave, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: droughty, slope.
TT*: Torreon	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
Thunderbird	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: large stones, thin layer.
US. Ustifluvents						
VA*: Vamer	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: slope, thin layer.
Rock outcrop.						
Eutroboralfs.						
Ve Vermejo	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt.
VX*: Vermejo	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: excess salt.
Xarde	Slight	Slight	Slight	Moderate: slope.	Moderate: low strength.	Moderate: excess salt.
YS*: Yankee	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.

See footnote at end of table.

TABLE 7.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
YS*:						
Saladon----------	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness, flooding.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 8.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
AA*:					
Apache	Severe: depth to rock.	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
Ayon	Severe: large stones.	Severe: large stones.	Severe: large stones.	Slight	Poor: large stones.
AB*:					
Apache	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
Rock outcrop.					
AC*:					
Apache	Severe: depth to rock.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
Rock outcrop.					
Ayon	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
AE*:					
Argiustolls.					
Rock outcrop.					
BA*:					
Barela	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
Yankee	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
BC*:					
Bernal	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Rock outcrop.					
Carnero	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Bd Breece Variant	Slight	Severe: seepage.	Severe: seepage.	Severe: seepage.	Good.
Be, Bf Brycan	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
BH*:					
Burnac	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
Hillery	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
CA*:					
Capulin	Moderate: percs slowly, large stones.	Moderate: seepage, slope, large stones.	Severe: large stones.	Slight	Poor: large stones.
Charette	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey.
Ayon	Severe: large stones.	Severe: large stones.	Severe: large stones.	Slight	Poor: large stones.
Cb Ceboya	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness.	Severe: flooding, wetness.	Poor: wetness.
CC*:					
Charette	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey.
Capulin	Moderate: percs slowly, large stones.	Moderate: seepage, slope, large stones.	Severe: large stones.	Slight	Poor: large stones.
CD*, Ce Colmor	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
CF*:					
Crews	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: area reclaim, too clayey, hard to pack.
Tricon	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: area reclaim, too clayey, hard to pack.
CN*:					
Cundiyo	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Nambe Variant	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
DA*:					
Dalcan	Severe: depth to rock, percs slowly, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, too clayey, large stones.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
DA*:					
Raton	Severe: depth to rock, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
DF*:					
Dargol	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Puera	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, hard to pack, large stones.
DR*:					
Dargol	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rocio	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Vamer	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
DV*:					
Dargol	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rocio	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Vamer	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
EB*:					
Btoe	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
Btown	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
ER*:					
Btoe	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
Rock outcrop.					
Rubble land.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
EV*: Eutroboralfs.					
Rock outcrop.					
Vamer	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
FH*: Firo	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Hesperus	Moderate: percs slowly, slope.	Severe: slope.	Moderate: slope, too clayey.	Severe: seepage.	Fair: too clayey, slope.
FR*: Firo	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Rock outcrop.					
FU*: Puera	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, hard to pack, large stones.
Dargol	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
HA*: Haplustolls.					
Rock outcrop.					
Hb, Hc Hesperus	Moderate: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Severe: seepage.	Fair: too clayey.
Ho*: Holman	Severe: poor filter, large stones.	Severe: seepage, flooding.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, large stones.
Holman	Severe: poor filter, large stones.	Severe: seepage, flooding.	Severe: seepage, too sandy, large stones.	Severe: seepage.	Poor: seepage, too sandy, large stones.
Ka Kinesava	Severe: percs slowly.	Severe: seepage.	Severe: depth to rock.	Severe: seepage.	Poor: thin layer.
Kb Kinesava	Severe: percs slowly.	Moderate: seepage, depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Poor: thin layer.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
KR*:					
Krakon	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
La La Brier	Severe: percs slowly.	Severe: flooding.	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
LM*:					
Litle	Severe: depth to rock.	Severe. depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
Mion	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
MA*:					
Maes	Severe: percs slowly, slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, hard to pack, large stones.
Etoe	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
MB*:					
Maes	Severe: percs slowly, slope, large stones.	Severe: seepage, slope, large stones.	Severe: slope, too clayey, large stones.	Severe: seepage, slope.	Poor: too clayey, hard to pack, large stones.
Etoe	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
Mc Manzano	Severe: percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
MD*, ME*:					
Mion	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Litle	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
Rock outcrop.					
MF*, MG*:					
Mion	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Penrose Variant	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
Mh------------------- Moreno	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight-----------	Poor: too clayey.
Mo------------------- Moreno	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
MR*:					
Moreno-------------	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey.
Brycan-------------	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight-----------	Fair: too clayey.
NR*:					
Nambe Variant------	Severe: slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope, large stones.	Severe: seepage, slope.	Poor: large stones, slope.
Rock outcrop.					
Rubble land.					
Pa, PB*------------- Partri	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Poor: small stones.
PC*:					
Partri-------------	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight-----------	Poor: small stones.
Carnero------------	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Bernal-------------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
PM*:					
Penrose------------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Mion---------------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Litle--------------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, hard to pack.
PT*:					
Pidineen-----------	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Severe: cemented pan.	Poor: area reclaim.
Tricon-------------	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, too clayey.	Severe: cemented pan.	Poor: area reclaim, too clayey, hard to pack.
RB*:					
Raton--------------	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
RB*: Barela	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock.	Poor: too clayey, hard to pack.
RD*: Raton	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Dalcan	Severe: depth to rock, percs slowly, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, too clayey, large stones.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
RE*: Raton	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
Rf Remunda	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Rh Remunda	Severe: percs slowly.	Moderate: seepage.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
RL*: Remunda	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Lavate Variant	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
RO*: Rock outcrop.					
Bernal	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
SA*: Sombordoro	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
Tuloso	Severe: depth to rock, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, large stones.	Severe: depth to rock.	Poor: area reclaim, large stones.
SB*: Sombordoro	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
SB*: Tuloso	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope, large stones.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
SM*: Spud	Severe: percs slowly, slope.	Severe: slope, large stones.	Severe: slope, too clayey, large stones.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Burnac	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: small stones, slope.
SW* Swastika	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey.
Sx Swastika	Severe: percs slowly.	Slight	Moderate: too clayey.	Slight	Fair: too clayey.
TA* Tinaja	Severe: poor filter, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: slope.	Poor: small stones, slope.
TT*: Torreon	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
Thunderbird	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
US. Ustifluvents					
VA*: Vamer	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Rock outcrop.					
Eutroboralfs.					
Ve Vermejo	Severe: percs slowly.	Severe: flooding.	Severe: excess salt.	Moderate: flooding.	Poor: hard to pack.
VK*: Vermejo	Severe: percs slowly.	Severe: flooding.	Severe: excess salt.	Moderate: flooding.	Poor: hard to pack.
Karde	Moderate: percs slowly.	Moderate: seepage, slope.	Slight	Slight	Good.
YS*: Yankee	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

See footnote at end of table.

TABLE 8.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
YS*:					
Saladon	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," "poor," "probable," and "improbable." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
AA*:				
Apache	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
Ayon	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
AB*:				
Apache	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
Rock outcrop.				
AC*:				
Apache	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones.
Rock outcrop.				
Ayon	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
AR*:				
Argiustolls.				
Rock outcrop.				
BA*:				
Barela	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
Yankee	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
BC*:				
Bernal	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Rock outcrop.				
Carnero	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Bd Breece Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
Be, Bf Brycan	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
BH*:				
Burnac	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Hillery	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
CA*:				
Capulin	Fair: low strength, large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
Charette	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Ayon	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim.
Cb Ceboya	Poor: low strength, wetness.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.
CC*:				
Charette	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Capulin	Fair: low strength, large stones, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
CD*, Ce Colmor	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
CP*:				
Crews	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
Tricon	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
CN*:				
Cundiyo	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Nambe Variant	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
DA*:				
Dalcan	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
DA*:				
Raton	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
DF*:				
Dargol	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Fuera	Fair: low strength, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
DR*:				
Dargol	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rocio	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Vamer	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
DV*:				
Dargol	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Rocio	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Vamer	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
EE*:				
Etoe	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Etown	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
ER*:				
Etoe	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Rock outcrop.				
Rubble land.				

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
EV*:				
Eutroboralfs.				
Rock outcrop.				
Vamer	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
FE*:				
Firo	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Hesperus	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
FR*:				
Firo	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
FU*:				
Fuera	Poor: slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Dargol	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
HA*:				
Haplustolls.				
Rock outcrop.				
Hb, Hc Hesperus	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
Ho*:				
Holman	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
Holman	Poor: large stones.	Improbable: large stones.	Improbable: large stones.	Poor: large stones, area reclaim.
Ka Kinesava	Fair: area reclaim, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.
Kb Kinesava	Fair: area reclaim, low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: thin layer.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
KR*:				
Krakon	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
La La Brier	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
LM*:				
Litle	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
Mion	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
MA*:				
Maes	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Etoe	Poor: large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
MB*:				
Maes	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Etoe	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Mc Manzano	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Good.
MD*, ME*:				
Mion	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Litle	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
Rock outcrop.				
MF*, MG*:				
Mion	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
MF*, MG*:				
Penrose Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
Mh, Mo Moreno	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
MR*:				
Moreno	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Brycan	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones.
NR*:				
Nambe Variant	Poor: large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones, area reclaim, slope.
Rock outcrop.				
Rubble land.				
Pa, PB* Partri	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
PC*:				
Partri	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Carnero	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Bernal	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
PN*:				
Penrose	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Mion	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Litle	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
PP*:				
Pidineen	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
PT*:				
Tricon	Poor: area reclaim, low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
RB*:				
Raton	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Barela	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim.
RD*:				
Raton	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Dalcan	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: large stones.
RE*:				
Raton	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
Rf, Rh Remunda	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
RL*:				
Remunda	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Lavate Variant	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
RO*:				
Rock outcrop.				
Bernal	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
SA*:				
Sombordoro	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.
Rock outcrop.				
Tuloso	Poor: area reclaim, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
SB*:				
Sombordoro	Poor: area reclaim, low strength, large stones.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
Tuloso	Poor: area reclaim, large stones, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: area reclaim, large stones, slope.
SN*:				
Spud	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
Burnac	Poor: thin layer.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
SW*, Sx Swastika	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
TA* Tinaja	Fair: slope.	Probable	Probable	Poor: small stones, area reclaim, slope.
TT*:				
Torreon	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Thunderbird	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
US. Ustifluvents				
VA*:				
Vamer	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, large stones, slope.
Rock outcrop.				
Eutroboralfs.				
Ve Vermejo	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
VX*:				
Vermejo	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: excess salt.
Xarde	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: excess salt.

See footnote at end of table.

TABLE 9.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
YS*:				
Yankee	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Saladon	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: wetness.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 10.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
AA*: Apache	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, depth to rock.	Large stones, depth to rock.	Large stones.
Ayon	Moderate: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, slope.	Large stones	Large stones, droughty.
AB*: Apache	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
AC*: Apache	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
Ayon	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
AR*: Argiustolls.						
Rock outcrop.						
BA*: Barela	Moderate: depth to rock, slope.	Moderate: hard to pack, large stones.	Deep to water	Large stones, percs slowly, slope.	Large stones, erodes easily.	Large stones, erodes easily.
Yankee	Slight	Moderate: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
BC*: Bernal	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
Carnero	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
Bd Breece Variant	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
Be Brycan	Moderate: seepage.	Severe: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
Bf Brycan	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
BH*: Burnac	Severe: slope.	Moderate: thin layer.	Deep to water	Percs slowly, slope.	Slope, large stones, percs slowly.	Slope, percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
BH*:						
Hillery	Severe: slope.	Moderate: piping, hard to pack, large stones.	Deep to water	Large stones, percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
CA*:						
Capulin	Moderate: seepage, slope.	Severe: piping.	Deep to water	Large stones, slope.	Large stones	Large stones.
Charette	Moderate: slope.	Moderate: thin layer.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Ayon	Moderate: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, slope.	Large stones	Large stones, droughty.
Cb Ceboya	Slight	Severe: wetness.	Flooding	Wetness, percs slowly, erodes easily.	Erodes easily, wetness.	Wetness, erodes easily.
CC*:						
Charette	Slight	Moderate: thin layer.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Capulin	Moderate: seepage.	Severe: piping.	Deep to water	Large stones	Large stones	Large stones.
CD* Colmor	Moderate: seepage, slope.	Severe: thin layer.	Deep to water	Slope, erodes easily.	Erodes easily	Erodes easily.
Ce Colmor	Moderate: seepage.	Severe: thin layer.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
CF*:						
Crews	Severe: cemented pan.	Severe: thin layer.	Deep to water	Cemented pan	Cemented pan, erodes easily.	Erodes easily, cemented pan.
Tricon	Moderate: cemented pan.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, cemented pan.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
CN*:						
Cundiyo	Severe: seepage, slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Nambe Variant	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
DA*:						
Dalcan	Moderate: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Large stones, depth to rock.	Large stones, droughty.
Raton	Severe: depth to rock.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Large stones, depth to rock.	Large stones, droughty.
DF*:						
Dargol	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
DP*:						
Puera	Severe: slope.	Severe: large stones.	Deep to water	Large stones, percs slowly.	Slope, large stones, percs slowly.	Large stones, slope.
DR*:						
Dargol	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Rocio	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Vamer	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
DV*:						
Dargol	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Rocio	Severe: slope.	Moderate: hard to pack, large stones.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Large stones, slope, percs slowly.
Vamer	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
EE*:						
Etoe	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones, slope.	Slope, large stones.	Large stones, slope.
Etown	Severe: slope.	Moderate: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope.
EG*:						
Etoe	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones	Slope, large stones.	Large stones.
Rock outcrop.						
Rubble land.						
EV*:						
Eutroboralfs.						
Rock outcrop.						
Vamer	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
HE*:						
Piro	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Hesperus	Severe: slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Slope, soil blowing.	Slope.
HH*:						
Piro	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
FU*:						
Fuera	Severe: slope.	Severe: large stones.	Deep to water	Large stones, percs slowly.	Slope, large stones, percs slowly.	Large stones, slope.
Dargol	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
HA*: Haplustolls.						
Rock outcrop.						
Hb Hesperus	Moderate: seepage.	Severe: piping.	Deep to water	Soil blowing	Soil blowing	Favorable.
Hc Hesperus	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope.	Soil blowing	Favorable.
Ho*: Holman	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Large stones, too sandy.	Large stones, droughty.
Holman	Severe: seepage.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Large stones, too sandy.	Large stones, droughty.
Ka Kinesava	Severe: seepage.	Severe: piping.	Deep to water	Soil blowing, slope.	Favorable	Favorable.
Kb Kinesava	Moderate: seepage, depth to rock.	Moderate: piping.	Deep to water	Favorable	Erodes easily	Erodes easily.
KR*: Krakon	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Rock outcrop.						
La La Brier	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
LM*: Litle	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly. depth to rock.	Depth to rock	Depth to rock.
Mion	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
MA*: Maes	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Etoe	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones	Slope, large stones.	Large stones.
MB*: Maes	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for-- Pond reservoir areas	Limitations for-- Embankments, dikes, and levees	Features affecting-- Drainage	Features affecting-- Irrigation	Features affecting-- Terraces and diversions	Features affecting-- Grassed waterways
MB*: Etoe	Severe: slope.	Severe: piping, large stones.	Deep to water	Large stones, slope.	Slope, large stones.	Large stones, slope.
Mc Manzano	Slight	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
MD*, ME*: Mion	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Litle	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Depth to rock	Depth to rock.
Rock outcrop.						
MF*: Mion	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Penrose Variant	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
MG*: Mion	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Penrose Variant	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
Mh Moreno	Moderate: slope.	Slight	Deep to water	Percs slowly, slope.	Large stones	Percs slowly.
Mo Moreno	Severe: slope.	Slight	Deep to water	Percs slowly, slope.	Slope, large stones.	Slope, percs slowly.
[illegible]*: Moreno	Severe: slope.	Slight	Deep to water	Percs slowly, slope.	Slope, large stones.	Slope, percs slowly.
Brycan	Moderate: seepage, slope.	Severe: piping.	Deep to water	Slope	Erodes easily	Erodes easily.
[illegible]*: Nambe Variant	Severe: seepage, slope.	Severe: seepage, large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Rock outcrop.						
Rubble land.						
Pa Partri	Slight	Moderate: piping.	Deep to water	Percs slowly, erodes easily.	Large stones, erodes easily.	Erodes easily, percs slowly.
PB* Partri	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Large stones, erodes easily.	Erodes easily, percs slowly.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
PC*:						
Partri	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Large stones, erodes easily.	Erodes easily, percs slowly.
Carnero	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
Bernal	Severe: depth to rock.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Depth to rock	Depth to rock.
PM*:						
Penrose	Severe: depth to rock, slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Mion	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Litle	Moderate: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock.	Depth to rock	Depth to rock.
PT*:						
Pidineen	Severe: cemented pan.	Severe: piping.	Deep to water	Cemented pan, slope.	Cemented pan	Cemented pan.
Tricon	Moderate: cemented pan, slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, cemented pan, slope.	Cemented pan, percs slowly.	Cemented pan, percs slowly.
RB*:						
Raton	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Barela	Moderate: depth to rock, slope.	Moderate: hard to pack, large stones.	Deep to water	Large stones, percs slowly, slope.	Large stones, erodes easily.	Large stones, erodes easily.
RD*:						
Raton	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Dalcan	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
RE*:						
Raton	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Rock outcrop.						
Rf, Rh Remunda	Moderate: seepage.	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Percs slowly.
RL*:						
Remunda	Moderate: seepage, slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly	Percs slowly.
Lavate Variant	Moderate: slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
RO*: Rock outcrop.						
Bernal	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
SA*, SB*: Sombordoro	Severe: depth to rock, slope.	Severe: large stones.	Deep to water	Large stones, droughty, percs slowly.	Slope, large stones, depth to rock.	Large stones, slope, erodes easily.
Rock outcrop.						
Tuloso	Severe: depth to rock, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
SP*: Spud	Severe: slope.	Severe: large stones.	Deep to water	Large stones, percs slowly, slope.	Slope, large stones, percs slowly.	Large stones, slope, percs slowly.
Burnac	Severe: slope.	Moderate: thin layer.	Deep to water	Percs slowly, slope.	Slope, large stones, percs slowly.	Slope, percs slowly.
SW* Swastika	Moderate: slope.	Moderate: piping.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily	Erodes easily, percs slowly.
Sx Swastika	Slight	Moderate: piping.	Deep to water	Percs slowly, erodes easily.	Erodes easily	Erodes easily, percs slowly.
TM* Tinaje	Severe: slope.	Severe: seepage.	Deep to water	Droughty, slope.	Slope	Slope, droughty.
TN*: Torreon	Moderate: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly	Percs slowly.
Thunderbird	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
UD. Ustifluvents						
VA*: Vamer	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Rock outcrop.						
Eutroboralfs.						
Ve Vermejo	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Excess salt, percs slowly.
VY*: Vermejo	Slight	Moderate: hard to pack.	Deep to water	Percs slowly	Percs slowly	Excess salt, percs slowly.
Yarde	Moderate: seepage, slope.	Severe: piping.	Deep to water	Soil blowing, slope, excess salt.	Erodes easily, soil blowing.	Excess salt, erodes easily.

See footnote at end of table.

TABLE 10.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
YS*:						
Yankee-----------	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
Saladon----------	Slight---------	Severe: wetness.	Percs slowly, flooding.	Wetness, percs slowly.	Erodes easily, wetness, percs slowly.	Wetness, erodes easily, percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--ENGINEERING INDEX PROPERTIES

[The symbol > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
AA*: Apache----------	0-12	Cobbly silt loam	CL-ML	A-4	15-40	80-100	75-95	65-90	50-75	25-30	5-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Ayon------------	0-18	Stony loam--------	ML	A-6, A-4	10-20	95-100	90-100	80-95	65-85	30-40	5-15
	18-60	Very stony sandy clay loam, very stony silt loam, extremely stony loam.	SM	A-4, A-6, A-2	45-70	75-85	70-80	60-75	30-50	30-40	5-15
AB*: Apache----------	0-13	Very stony loam	SM-SC,	A-4	45-65	80-95	75-85	50-65	35-50	25-30	5-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
AC*: Apache----------	0-13	Cobbly loam------	CL-ML	A-4	15-40	80-100	75-95	65-90	50-75	25-30	5-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Ayon------------	0-6	Very stony loam	ML	A-6, A-4	30-55	95-100	90-100	80-95	65-85	30-40	5-15
	6-60	Very stony sandy clay loam, very stony silt loam, extremely stony loam.	SM	A-4, A-6, A-2	45-70	75-85	70-80	60-75	30-50	30-40	5-15
AD*: Argiustolls.											
Rock outcrop.											
BA*: Barela----------	0-11	Loam-------------	ML, CL-ML	A-4	0-10	95-100	90-100	85-100	65-90	15-35	5-10
	11-26	Silty clay, silty clay loam, clay loam.	ML, CL	A-6	0-15	95-100	90-100	85-100	70-95	35-40	10-20
	26-45	Stony clay, cobbly silty clay, stony clay loam.	CH, CL	A-7	25-30	95-100	90-100	85-100	70-90	45-60	20-35
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Yankee----------	0-18	Loam-------------	CL-ML	A-4	0	100	100	90-100	70-90	25-30	5-10
	18-60	Clay, silty clay, clay loam.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	15-30
BC*: Bernal----------	0-3	Loam-------------	CL, SC	A-6	0	100	100	80-95	40-65	25-35	10-15
	3-14	Clay loam, sandy clay loam.	CL, SC	A-6	0	100	100	80-95	45-75	25-35	10-20
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
BC*:											
Carnero	0-6	Loam	CL-ML, CL, ML	A-4	0-5	85-100	80-100	70-100	50-95	20-30	NP-10
	6-30	Silty clay, silty clay loam.	CL, CH	A-7	0-5	85-100	80-100	80-100	60-95	40-55	15-30
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bd	0-10	Sandy loam	SM	A-2, A-4	0-5	95-100	90-100	55-70	30-50	---	NP
Breece Variant	10-60	Sandy loam, loam	SM, ML	A-4	0-5	90-100	85-100	55-75	35-55	15-20	NP-5
Be	0-8	Loam	CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
Brycan	8-60	Sandy clay loam, loam, clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0-10	95-100	90-100	75-90	35-65	25-35	5-15
Bf	0-15	Loam	CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
Brycan	15-60	Sandy clay loam, loam, clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0-10	95-100	90-100	75-90	35-65	25-35	5-15
BH*:											
Burnac	0-15	Stony loam	ML, CL-ML	A-4	20-30	90-100	85-95	75-90	55-70	25-35	5-10
	15-40	Clay, silty clay, clay loam.	CL, CH	A-7	0	90-100	85-95	80-95	70-85	40-55	15-30
	40-50	Stony silty clay, very stony silty clay.	CL, CH	A-7	15-30	65-75	60-70	55-65	50-60	40-55	15-30
	50	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hillery	0-14	Stony loam	ML	A-4	5-20	90-100	85-100	75-95	60-75	---	NP
	14-60	Clay, cobbly clay, cobbly silty clay.	CH, ML, CL, MH	A-7	10-30	85-100	80-100	70-95	60-85	40-55	10-30
CA*:											
Capulin	0-3	Loam	CL, CL-ML	A-6, A-4	0-5	80-100	80-100	75-100	50-90	25-40	5-20
	3-35	Clay loam, silt loam, loam.	CL	A-7	0-5	80-100	80-100	75-100	50-85	40-50	15-25
	35-60	Cobbly loam, loam, clay loam.	CL, ML	A-4, A-6	15-25	85-100	80-100	70-100	50-85	30-40	5-20
Charette	0-3	Loam	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	3-60	Clay loam, silty clay, clay.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-90	35-45	15-25
Ayon	0-13	Stony loam	ML	A-6, A-4	10-20	95-100	90-100	80-95	65-85	30-40	5-15
	13-60	Very stony sandy clay loam, very stony silt loam, very stony loam.	SM	A-4, A-6, A-2	45-60	75-85	70-80	60-75	30-50	30-40	5-15
Cb	0-9	Silty clay loam	CL	A-6	0	100	100	90-100	80-95	30-40	10-15
Ceboya	9-23	Silty clay loam, clay loam.	CL	A-6	0	100	100	90-100	80-95	30-40	10-20
	23-60	Silty clay, clay	CH	A-7	0	95-100	85-100	80-95	70-90	50-60	25-35
CC*:											
Charette	0-12	Loam	ML, CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	12-51	Clay loam, silty clay, clay.	CL	A-6, A-7	0-5	95-100	90-100	85-100	70-90	35-45	15-25
	51-70	Clay loam, sandy clay loam, loam.	CL, CL-ML, SC, SM-SC	A-4, A-6	0-10	90-100	85-100	70-90	40-65	25-40	5-15
Capulin	0-12	Loam	CL, CL-ML	A-6, A-4	0-5	80-100	80-100	75-100	50-90	25-40	5-20
	12-60	Clay loam, silt loam, silty clay loam.	CL	A-7	0-5	80-100	80-100	75-100	50-85	40-50	15-25

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
[illegible]*: Colmor	0-10	Loam	CL-ML	A-4	0	100	100	95-100	70-85	25-30	5-10
	10-32	Silty clay loam, clay loam, loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	32-60	Loam, silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	75-85	25-35	5-15
[illegible]: Colmor	0-3	Silt loam	CL-ML	A-4	0	100	100	95-100	70-85	25-30	5-10
	3-15	Silty clay loam, clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	15-60	Loam, silt loam	CL-ML, CL	A-4, A-6	0	100	100	95-100	75-85	25-35	5-15
[illegible]*: Crews	0-3	Silt loam	CL-ML, CL	A-4, A-6	0	85-100	80-100	70-100	50-85	25-35	5-15
	3-14	Clay loam, clay	CL, CH	A-6, A-7	0	85-100	80-100	75-100	55-95	35-55	15-30
	14	Indurated	---	---	---	---	---	---	---	---	---
Tricon	0-4	Silt loam	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-90	20-35	5-15
	4-28	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	75-90	35-55	15-30
	28-40	Gravelly clay loam.	CL, GC	A-6	0-5	60-80	55-75	50-70	40-60	30-40	10-15
	40	Indurated	---	---	---	---	---	---	---	---	---
[illegible]*: Cundiyo	0-5	Very stony sandy loam.	SM	A-2, A-4, A-1	40-55	60-85	50-80	40-55	20-45	---	NP
	5-45	Very cobbly loam, very cobbly sandy loam, very stony sandy loam.	GM, SM	A-2, A-4, A-1	35-55	55-75	50-70	40-60	20-50	15-20	NP-5
	45-60	Very cobbly loamy sand, extremely stony sandy loam.	GM, SM	A-1	55-75	45-75	40-70	25-35	10-25	---	NP
Nambe Variant	0-4	Very cobbly loam	SM	A-2	35-45	75-85	65-75	40-55	25-35	20-25	NP-5
	4-60	Very cobbly fine sandy loam, extremely cobbly sandy loam.	GM, GM-GC	A-2, A-1	50-80	45-55	40-50	30-40	10-20	20-25	NP-10
[illegible]*: Dalcan	0-4	Cobbly loam	CL-ML	A-4	20-40	75-95	70-90	65-80	50-75	25-35	5-10
	4-28	Very cobbly clay, very cobbly clay loam, very stony clay.	CL, CH	A-6, A-7	40-70	85-95	80-90	75-80	50-70	35-55	10-30
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Raton	0-6	Very cobbly loam	CL, CL-ML	A-4, A-6	50-60	85-95	80-90	75-90	60-80	25-35	5-15
	6-12	Very stony clay, very stony silty clay.	CH, CL	A-7	50-60	85-95	80-90	75-90	65-85	45-55	20-30
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[illegible]*: Vargol	0-6	Stony loam	ML, SM	A-4	5-15	90-100	70-90	55-85	35-65	20-30	NP-5
	6-38	Clay	CH, MH	A-7	5-10	90-100	85-100	65-90	60-80	50-60	20-30
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
DF*:											
Puera------------	0-15	Cobbly loam------	ML, CL-ML	A-4	15-40	85-95	80-90	55-75	50-65	25-35	5-10
	15-32	Clay, cobbly clay	CL, CH	A-7	5-30	85-95	80-90	75-85	60-80	40-55	20-30
	32-60	Stony silty clay, cobbly clay, very cobbly clay.	CL, CH, SC, GC	A-7	20-65	70-80	65-75	55-70	40-65	40-55	20-30
DR*:											
Dargol-----------	0-12	Stony loam-------	ML, SM	A-4	5-15	90-100	70-90	55-85	35-65	20-30	NP-5
	12-27	Clay-------------	CH, MH	A-7	5-10	90-100	85-100	65-90	60-80	50-60	20-30
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rocio------------	0-14	Gravelly loam----	SM-SC, CL-ML, GM-GC	A-2	0-15	65-80	60-75	50-60	45-55	<30	5-10
	14-60	Clay, silty clay	CH	A-7	0-10	90-100	90-100	75-100	50-95	50-60	25-35
Vamer------------	0-8	Stony loam-------	ML, SM	A-4	10-20	85-95	75-85	70-85	45-65	25-35	NP-10
	8-17	Clay-------------	CL, CH	A-7	0-15	95-100	90-100	80-95	70-90	45-55	20-30
	17	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
DV*:											
Dargol-----------	0-8	Stony loam-------	ML, SM	A-4	5-15	90-100	70-80	55-80	35-65	20-30	NP-5
	8-35	Clay-------------	CH, MH	A-7	5-10	90-100	85-100	65-90	60-80	50-60	20-30
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rocio------------	0-15	Stony loam-------	CL-ML	A-4	10-30	80-90	75-85	70-80	60-75	25-30	5-10
	15-65	Clay, sandy clay	CL, CH	A-7	0-5	95-100	90-100	75-90	60-80	40-55	25-40
Vamer------------	0-3	Stony loam-------	ML, SM	A-4	10-20	85-95	75-85	70-85	45-65	25-35	NP-10
	3-16	Clay, clay loam	CL, CH	A-7	0-15	95-100	90-100	80-95	70-90	45-55	20-30
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
EE*:											
Etoe-------------	0-10	Cobbly loam------	SM, GM	A-2, A-4	15-40	65-85	65-85	55-75	30-45	20-30	NP-5
	10-28	Cobbly loam, very cobbly sandy loam, very cobbly loam.	SM, GM	A-2, A-4	15-60	65-85	60-80	55-75	30-45	20-30	NP-5
	28-60	Very cobbly sandy clay loam, very stony sandy clay loam, very cobbly loam.	SM-SC, SC	A-4, A-6	35-40	75-85	65-80	45-70	35-50	20-35	5-15
Etown------------	0-11	Gravelly loam----	GM-GC	A-2, A-4	10-15	65-80	60-75	35-55	25-40	20-25	5-10
	11-60	Very gravelly clay loam, extremely gravelly clay.	GC	A-2	20-30	30-55	25-50	20-35	15-25	35-45	15-25
ER*:											
Etoe-------------	0-12	Cobbly fine sandy loam.	GM	A-2, A-4	15-30	75-95	70-90	50-60	30-40	20-25	NP-5
	12-24	Cobbly loam, very cobbly sandy loam, cobbly fine sandy loam.	SM, GM	A-2, A-4	15-60	65-85	60-80	55-75	30-45	20-30	NP-5
	24-60	Very cobbly sandy clay loam, very stony sandy clay loam, very cobbly sandy loam.	SM-SC, SC	A-4, A-6	35-40	75-85	70-80	45-70	35-50	20-35	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
[illegible]*:											
Rock outcrop.											
Rubble land.											
[illegible]*:											
Eutroboralfs.											
Rock outcrop.											
Vamer-----------	0-6	Cobbly loam-------	ML, SM	A-4	10-20	85-95	80-90	70-85	45-65	25-35	NP-10
	6-12	Clay---------------	CL, CH	A-7	0-15	95-100	90-100	80-95	70-90	45-55	20-30
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[illegible]*:											
Piro-------------	0-7	Cobbly sandy loam	SM	A-2, A-4	15-40	85-95	80-90	50-65	30-45	20-25	NP-5
	7-14	Very cobbly clay loam, very cobbly loam.	CL-ML, CL	A-4, A-6	45-65	75-90	70-85	60-75	50-65	25-35	5-15
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hesperus---------	0-18	Sandy loam--------	SM	A-2, A-4	0	80-100	75-95	45-70	25-50	20-25	NP-5
	18-60	Clay loam, sandy clay loam, sandy loam.	SM, ML	A-4	0-5	80-100	75-95	50-90	35-90	25-40	NP-10
[illegible]*:											
Piro-------------	0-3	Very stony loam	SM-SC, CL-ML	A-4	40-55	75-90	70-85	55-75	40-60	20-30	5-10
	3-11	Very cobbly clay loam, very cobbly loam.	CL-ML, CL	A-4, A-6	40-55	75-90	70-85	60-75	50-65	25-35	5-15
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
[illegible]*:											
Puera------------	0-14	Cobbly loam-------	ML, CL-ML	A-4	15-40	85-95	80-90	55-75	50-65	25-35	5-10
	14-39	Clay, cobbly clay	CL, CH	A-7	5-30	85-95	80-90	75-85	60-80	40-55	20-30
	39-60	Stony silty clay, cobbly clay, very cobbly clay.	CL, CH, SC, GC	A-7	20-65	70-80	65-75	55-70	40-65	40-55	20-30
Dargol-----------	0-13	Stony loam--------	ML, SM	A-4	5-15	90-100	70-80	55-80	35-65	20-30	NP-5
	13-37	Clay---------------	CH, MH	A-7	5-10	90-100	85-100	65-90	60-80	50-60	20-30
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
[illegible]*:											
Haplustolls.											
Rock outcrop.											
Hb--------------- Hesperus	0-12	Sandy loam--------	SM	A-2, A-4	0	80-100	75-95	45-70	25-50	20-25	NP-5
	12-33	Clay loam, loam, silty clay loam.	ML	A-4	0-5	90-100	90-100	80-95	70-90	25-40	NP-10
	33-64	Loam, clay loam, sandy clay loam.	SM, ML	A-4	0-10	85-100	85-95	50-90	35-90	25-40	NP-10
Hc--------------- Hesperus	0-10	Sandy loam--------	SM	A-2, A-4	0	80-100	75-95	45-70	25-50	20-25	NP-5
	10-32	Clay loam, loam, silty clay loam.	ML	A-4	0-5	90-100	90-100	80-95	70-90	25-40	NP-10
	32-60	Loam, clay loam, sandy clay loam.	SM, ML	A-4	0-10	85-100	85-95	50-90	35-90	25-40	NP-10

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
Ho*:											
Holman----------	0-10	Very cobbly sandy loam.	SM	A-1, A-2	40-50	70-80	65-75	40-50	20-30	---	NP
	10-14	Very cobbly loamy sand.	SM	A-1	40-50	70-80	65-75	30-50	10-20	---	NP
	14-60	Extremely cobbly coarse sand.	SP-SM	A-1	65-70	65-75	60-70	30-40	5-10	---	NP
Holman----------	0-12	Extremely cobbly sandy loam.	SM	A-1, A-2	65-70	65-75	60-70	35-50	20-30	---	NP
	12-60	Extremely cobbly sand, extremely cobbly loamy sand.	SP-SM	A-1	65-70	65-75	60-70	30-40	5-10	---	NP
Ka---------------- Kinesava	0-21	Sandy loam-------	SC, SM-SC, CL, CL-ML	A-4	0	100	100	80-90	40-55	20-30	5-10
	21-75	Clay, clay loam	CL, CH	A-7	0	100	100	80-90	65-90	40-60	15-30
Kb---------------- Kinesava	0-29	Loam-------------	CL	A-6	0	100	100	85-95	70-85	25-35	10-15
	29-70	Clay, clay loam	CL, CH	A-7	0	100	100	80-90	65-90	40-60	15-30
KR*:											
Krakon----------	0-6	Clay loam--------	CL	A-6	0-5	85-100	80-100	75-95	60-75	30-40	10-15
	6-14	Clay loam, loam, channery clay loam.	CL	A-6	0-10	70-95	65-90	60-80	50-65	30-40	10-15
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
La---------------- La Brier	0-6	Silty clay loam	ML, CL	A-6, A-7	0	100	100	95-100	85-100	35-45	10-20
	6-36	Silty clay loam, clay loam, clay.	CL, CH	A-7	0	100	100	95-100	85-100	40-55	15-30
	36-60	Clay loam--------	ML, CL	A-7	0	100	100	95-100	85-100	40-50	10-25
LM*:											
Litle-----------	0-6	Clay loam--------	CL	A-6, A-7	0	100	100	90-100	70-80	30-45	10-20
	6-36	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
Mion------------	0-4	Silty clay loam	CL	A-6	0	100	100	90-100	80-90	30-40	10-15
	4-15	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	75-95	45-55	20-30
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---
MA*:											
Maes------------	0-24	Cobbly loam------	SM, ML	A-4	15-25	85-95	80-90	60-85	35-65	20-30	NP-5
	24-60	Very cobbly sandy clay, very cobbly sandy clay loam, very cobbly clay loam.	SC	A-2, A-6, A-7	35-50	70-90	55-75	50-75	25-50	30-45	10-20
Etoe------------	0-6	Very cobbly sandy loam.	SM, GM	A-2	30-40	55-75	45-70	35-45	25-35	20-25	NP-5
	6-33	Cobbly loam, very cobbly sandy loam, very cobbly loam.	SM, GM	A-2, A-4	15-60	65-85	60-80	55-75	30-45	20-30	NP-5
	33-60	Very cobbly sandy clay loam, very stony sandy clay loam, very cobbly loam.	GC, GP-GC, GM-GC	A-1, A-2	25-30	40-70	35-65	10-25	5-15	20-35	5-15

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MF*: Maes	0-17	Very cobbly loam	SM	A-2, A-4	30-40	65-80	60-75	50-70	25-45	20-30	NP-5
	17-60	Very cobbly sandy clay, very cobbly loam.	SC	A-2, A-6, A-7	35-50	70-90	55-75	50-70	25-50	30-45	10-20
Etoe	0-5	Cobbly loam	SM, GM	A-2, A-4	10-15	70-90	65-85	55-75	30-45	20-30	NP-5
	5-32	Cobbly loam, very cobbly sandy loam, very cobbly loam.	SM, GM	A-2, A-4	15-60	65-85	60-80	55-75	30-45	20-30	NP-5
	32-60	Very cobbly sandy clay loam, very stony sandy clay loam, very cobbly sandy loam.	GC, GP-GC, GM-GC	A-1, A-2	25-30	40-70	35-65	10-25	5-15	20-35	5-15
Mc Manzano	0-9	Loam	CL-ML	A-4	0	100	100	85-100	60-80	20-30	5-10
	9-60	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	60-85	25-40	5-15
MF*: Mion	0-4	Very flaggy silt loam.	SM-SC	A-4	30-55	70-80	65-75	50-65	35-50	20-30	5-10
	4-14	Flaggy silty clay, flaggy clay.	CH	A-7	20-25	75-85	70-80	65-80	55-75	50-60	25-35
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Litle	0-6	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-80	30-45	10-20
	6-32	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	32	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
MF*: Mion	0-4	Flaggy silt loam	CL	A-6	20-25	70-90	65-85	60-80	50-70	30-40	10-20
	4-16	Flaggy silty clay, flaggy clay.	CH	A-7	20-25	75-85	70-80	65-80	55-75	50-60	25-35
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Litle	0-5	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-80	30-45	10-20
	5-36	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	36	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
MF*: Mion	0-4	Very flaggy silt loam.	SM-SC	A-4	30-45	70-80	65-75	50-65	35-50	20-30	5-10
	4-16	Flaggy silty clay, flaggy clay.	CH	A-7	20-25	75-85	70-80	65-80	55-75	50-60	25-35
	16	Weathered bedrock	---	---	---	---	---	---	---	---	---
Penrose Variant	0-8	Very channery loam.	GM	A-2, A-4	20-30	55-65	50-60	40-55	30-45	20-25	NP-5
	8-18	Very channery loam.	GC, GM-GC	A-2, A-6, A-4	20-30	55-65	50-60	40-55	30-45	25-35	5-15
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
MG*:											
Mion	0-3	Flaggy silt loam	CL-ML	A-4	20-25	70-90	65-85	60-80	50-70	20-30	5-10
	3-12	Flaggy silty clay, flaggy clay.	CH	A-7	20-25	75-85	70-80	65-80	55-75	50-60	25-35
	12	Weathered bedrock	---	---	---	---	---	---	---	---	---
Penrose Variant	0-4	Channery loam	GM, ML, SM	A-2, A-4	5-15	55-80	55-75	45-70	30-55	20-25	NP-5
	4-11	Very channery loam.	GC, GM-GC	A-2, A-6, A-4	20-30	55-65	50-60	40-55	30-45	25-35	5-15
	11	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Mh	0-10	Loam	ML, CL-ML	A-4	5-10	95-100	90-95	75-90	55-70	25-35	5-10
Moreno	10-60	Clay loam, clay.	CL	A-6, A-7	5-15	95-100	70-95	60-90	50-75	35-50	15-25
Mo	0-11	Loam	ML, CL-ML	A-4	5-10	95-100	90-95	75-90	55-70	25-35	5-10
Moreno	11-60	Clay loam, clay	CL	A-6, A-7	5-15	95-100	70-95	60-90	50-75	35-50	15-25
MR*:											
Moreno	0-13	Sandy clay loam	CL-ML	A-4	5-10	95-100	90-95	75-90	55-70	20-30	5-10
	13-60	Clay loam, clay, gravelly sandy clay loam.	CL	A-6, A-7	5-15	95-100	70-95	60-90	50-75	35-50	15-25
Brycan	0-16	Loam	CL-ML	A-4	0	100	100	85-95	60-75	25-35	5-10
	16-60	Sandy clay loam, loam, clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0-10	95-100	90-100	75-90	35-65	25-35	5-15
NR*:											
Nambe Variant	0-10	Very stony sandy loam.	SM	A-2	30-50	75-85	65-75	40-55	25-35	20-25	NP-5
	10-60	Very stony sandy loam, very cobbly fine sandy loam.	SM	A-2, A-1	30-60	65-75	55-65	35-45	15-25	20-25	NP-5
Rock outcrop.											
Rubble land.											
Pa	0-3	Loam	CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
Partri	3-30	Clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	90-100	80-100	75-85	40-60	20-35
	30-60	Gravelly clay loam, cobbly silty clay loam, gravelly loam.	GC, SC, SM, GM	A-7	10-25	70-90	65-85	55-75	45-55	40-45	10-20
PB*	0-2	Loam	CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
Partri	2-60	Clay loam, silty clay loam, clay.	CL, CH	A-7	0	95-100	90-100	80-100	75-85	40-60	20-35
PC*:											
Partri	0-3	Loam	CL-ML	A-4	0	100	100	90-100	70-90	20-30	5-10
	3-35	Clay loam, silty clay, clay.	CL, CH	A-7	0	95-100	90-100	80-100	75-85	40-60	20-35
	35-60	Gravelly clay loam, cobbly silty clay loam, gravelly loam.	GC, SC, SM, GM	A-7	10-25	70-90	65-85	55-75	45-55	40-45	10-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
PC*:											
Carnero	0-9	Loam	CL-ML, CL, ML	A-4	0-5	85-100	80-100	70-100	50-90	20-30	NP-10
	9-28	Clay, silty clay, silty clay loam.	CL, CH	A-7	0-5	85-100	80-100	80-100	60-95	40-55	15-30
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bernal	0-9	Loam	CL, SC	A-6	0	100	100	80-95	40-65	25-35	10-15
	9-19	Clay loam, sandy clay loam.	CL, SC	A-6	0	100	100	80-95	45-75	25-35	10-20
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
PN*:											
Penrose	0-19	Channery loam	ML, CL-ML, GM	A-4	5-20	60-75	60-75	50-75	40-60	15-25	NP-5
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mion	0-10	Flaggy silty clay loam.	CL	A-6	20-25	70-90	65-85	60-80	50-70	30-40	10-20
	10-15	Flaggy silty clay, flaggy clay.	CH	A-7	20-25	75-85	70-80	65-80	55-75	50-60	25-35
	15	Weathered bedrock	---	---	---	---	---	---	---	---	---
Litle	0-3	Clay loam	CL	A-6, A-7	0	100	100	90-100	70-80	30-45	10-20
	3-30	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	80-95	40-55	15-30
	30	Weathered bedrock	---	---	---	---	---	---	---	---	---
PT*:											
Pidineen	0-7	Stony loam	CL-ML, ML	A-4	5-25	85-95	80-90	70-85	60-75	20-25	NP-10
	7-13	Loam, silt loam, clay loam.	CL-ML, ML	A-4	0-5	90-100	90-95	70-85	65-80	20-30	NP-10
	13-16	Gravelly loam, gravelly silt loam.	ML, GM, CL-ML, GM-GC	A-4	0-15	65-80	60-75	50-65	40-60	20-25	NP-10
	16	Indurated	---	---	---	---	---	---	---	---	---
Tricon	0-2	Loam	CL-ML, CL	A-4, A-6	0	100	100	85-100	70-90	20-35	5-15
	2-20	Clay loam, clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	90-100	75-90	35-55	15-30
	20-28	Gravelly clay loam.	CL, GC	A-6	0-5	60-80	55-75	50-70	40-60	30-40	10-15
	28	Indurated	---	---	---	---	---	---	---	---	---
RB*:											
Raton	0-9	Very stony silt loam.	CL, CL-ML	A-6, A-4	45-55	85-95	80-90	75-90	60-80	25-35	5-15
	9-15	Very stony clay, very stony silty clay.	CH, CL	A-7	45-60	85-95	80-90	75-90	65-85	45-55	20-30
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Barela	0-13	Silt loam	ML, CL-ML	A-4	0-10	95-100	90-100	85-100	65-90	15-35	5-10
	13-31	Silty clay, silty clay loam, clay.	ML, CL	A-6	0-15	95-100	90-100	85-100	70-95	35-40	10-20
	31-44	Stony clay, cobbly silty clay, stony clay loam.	CH, CL	A-7	25-30	95-100	90-100	85-100	70-90	45-60	20-35
	44	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag- ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas- ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
RD*:											
Raton-----------	0-6	Very cobbly silt loam.	CL, CL-ML	A-4, A-6	50-60	85-95	80-90	75-90	60-80	25-35	5-15
	6-15	Very stony clay, very stony silty clay.	CH, CL	A-7	50-60	85-95	80-90	75-90	65-85	45-55	20-30
	15	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Dalcan----------	0-5	Stony silt loam	CL-ML	A-4	25-35	75-95	70-90	65-80	50-75	25-35	5-10
	5-35	Very cobbly clay, very cobbly clay loam, very stony clay.	CL, CH	A-6, A-7	45-70	85-95	80-90	75-80	50-70	35-55	10-30
	35	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
RE*:											
Raton-----------	0-4	Very stony silt loam.	CL, CL-ML	A-6, A-4	45-60	85-95	80-90	75-90	60-80	25-35	5-15
	4-10	Very stony clay, very stony silty clay loam.	CH, CL	A-7	50-60	85-95	80-90	75-90	65-85	45-55	20-30
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Rf--------------- Remunda	0-10	Loam-------------	CL-ML	A-4	0	100	100	85-95	60-75	25-30	5-10
	10-40	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	75-95	40-55	15-35
	40-60	Clay loam, loam	CL	A-6	0	100	100	90-100	70-80	25-35	10-20
Rh--------------- Remunda	0-12	Clay loam--------	CL	A-6	0	100	100	90-100	75-90	30-40	10-20
	12-38	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	75-95	40-55	15-35
	38-60	Clay loam, loam	CL	A-6	0	100	100	90-100	70-80	25-35	10-20
RL*:											
Remunda---------	0-15	Loam-------------	CL-ML	A-4	0	100	100	85-95	60-75	25-30	5-10
	15-52	Clay loam, clay	CL, CH	A-7	0	100	100	90-100	75-95	40-55	15-35
	52-60	Clay loam, loam	CL	A-6	0	100	100	90-100	70-80	25-35	10-20
Lavate Variant--	0-10	Loam-------------	CL-ML	A-4	0	100	100	85-95	60-75	20-30	5-10
	10-60	Sandy clay loam, clay loam.	CL, SC	A-6	0	95-100	90-100	80-90	40-70	30-40	10-15
RO*:											
Rock outcrop.											
Bernal----------	0-3	Stony loam-------	CL-ML	A-4	15-35	90-100	85-95	75-90	55-70	20-30	5-10
	3-10	Gravelly clay loam, gravelly sandy clay loam, cobbly clay loam.	SC	A-2, A-6	5-15	70-90	65-85	50-70	30-50	30-40	10-20
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SA*:											
Sombordoro------	0-3	Very stony sandy loam.	SM	A-2, A-4	50-55	90-95	85-90	60-80	30-50	---	NP
	3-14	Very stony clay, very stony sandy clay.	CL, CH, SC	A-6, A-7	50-65	85-95	80-90	70-80	40-60	35-55	20-30
	14	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
SM*: Tuloso	0-2	Very stony loam	SM	A-2, A-4	30-40	65-80	55-70	35-45	25-50	20-30	NP-10
	2-17	Very stony fine sandy loam, very stony loam.	SM, SM-SC, ML, CL-ML	A-4	35-55	75-85	65-75	55-75	35-55	20-30	NP-10
	17	Bedrock	---	---	---	---	---	---	---	---	---
SN*: Sombordoro	0-9	Very stony sandy loam.	SM	A-2, A-4	45-55	90-95	85-90	60-80	30-50	---	NP
	9-18	Very stony clay, very stony sandy clay.	CL, CH, SC	A-6, A-7	45-65	85-95	80-90	70-80	40-60	35-55	20-30
	18	Weathered bedrock	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Tuloso	0-4	Very stony sandy loam.	SM	A-2, A-4	30-40	65-80	55-70	35-45	25=50	20-30	NP-10
	4-10	Very stony fine sandy loam, very stony loam.	SM, SM-SC, ML, CL-ML	A-4	35-55	75-85	65-75	55-75	35-55	20-30	NP-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SP*: Spud	0-22	Very stony loam	SM, SM-SC, ML, CL-ML	A-4	35-45	75-85	70-80	60-75	45-55	25-35	5-10
	22-49	Clay, silty clay, clay loam.	CL, CH	A-7	0-15	90-100	85-95	80-95	65-85	40-55	15-30
	49-68	Stony clay loam, stony clay, stony silty clay.	CL	A-6, A-7	20-30	90-100	85-95	80-95	65-85	35-45	15-25
	68-78	Very stony sandy clay loam, very stony sandy clay.	SC	A-2	35-55	70-80	65-75	50-65	25-35	30-40	10-20
Burnac	0-15	Stony loam	ML, CL-ML	A-4	20-30	90-100	85-95	75-90	55-70	25-35	5-10
	15-37	Clay, silty clay, clay loam.	CL, CH	A-7	0	90-100	85-95	80-95	70-85	40-55	15-30
	37-60	Stony silty clay, very stony silty clay.	CL, CH	A-7	15-30	65-75	60-70	55-65	50-60	40-55	15-30
	60	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
SW* Swastika	0-5	Silt loam	CL-ML	A-4	0	100	100	95-100	75-85	25-30	5-10
	5-10	Clay loam	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
	10-33	Silty clay, silty clay loam.	CL, CH	A-6, A-7	0	100	100	95-100	90-95	35-55	20-35
	33-60	Silty clay loam, clay loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20
Sx Swastika	0-8	Silty clay loam	CL	A-6	0	100	100	95-100	80-90	30-40	10-20
	8-25	Silty clay	CL, CH	A-6, A-7	0	100	100	95-100	90-95	35-55	20-35
	25-60	Silty clay loam, silt loam.	CL	A-6	0	100	100	95-100	85-95	30-40	10-20

See footnote at end of table.

TABLE 11.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
TA* Tinaja	0-10	Gravelly loam	SM	A-2, A-4	0-5	70-90	60-75	45-70	25-50	25-30	NP-5
	10-25	Very gravelly sandy clay loam, gravelly sandy clay loam, very gravelly loam.	GM, SM	A-2, A-1	0-5	50-70	30-55	25-50	10-35	25-30	NP-5
	25-68	Extremely gravelly loamy sand, very gravelly sand, very gravelly sandy loam.	GW, GP, GP-GM, GW-GM	A-1	0-5	20-45	15-35	5-20	0-10	---	NP
TT*:											
Torreon	0-2	Loam	CL-ML	A-4	0-5	90-100	80-95	75-90	60-80	20-30	5-10
	2-12	Clay loam, silty clay loam.	CL	A-7	0-5	90-100	80-95	75-90	65-85	40-50	15-25
	12-60	Silty clay, clay, clay loam.	CH	A-7	0-5	80-100	80-90	80-90	60-80	50-60	25-30
Thunderbird	0-2	Cobbly loam	CL-ML	A-4	20-30	90-100	85-95	75-95	60-80	20-30	5-10
	2-36	Clay, silty clay loam.	CL, CH	A-7	5-10	95-100	90-95	80-90	60-85	40-60	25-35
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
US. Ustifluvents											
VA*:											
Vamer	0-4	Stony loam	ML, SM	A-4	15-30	85-95	80-90	70-85	45-65	25-35	NP-10
	4-14	Clay	CL, CH	A-7	0-15	95-100	90-100	80-95	70-90	45-55	20-30
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Eutroboralfs.											
Ve Vermejo	0-2	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-45	10-20
	2-60	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	75-95	45-55	20-35
VK*:											
Vermejo	0-2	Silty clay loam	CL, ML	A-6, A-7	0	100	100	95-100	85-95	35-45	10-20
	2-60	Silty clay, clay	CL, CH	A-7	0	100	100	90-100	75-95	45-55	20-35
Karde	0-3	Fine sandy loam	ML, SM, CL-ML, SM-SC	A-4	0	100	100	70-85	40-55	15-25	NP-10
	3-60	Loam, clay loam, silt loam.	CL, CL-ML	A-4, A-6	0	100	100	85-100	75-85	25-40	5-15
YS*:											
Yankee	0-16	Loam	CL-ML	A-4	0	100	100	90-100	70-90	25-30	5-10
	16-60	Clay, silty clay, silty clay loam.	CL, CH	A-7	0	100	100	90-100	75-95	40-55	15-30
Saladon	0-4	Mucky silty clay loam.	OL	A-7	0	100	100	95-100	90-95	45-50	15-20
	4-60	Clay, silty clay, clay loam.	CL, CH	A-7	0	95-100	90-100	85-90	70-95	40-55	20-30

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Wind erodibility group" and "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
AA*:											
Apache	0-12	20-27	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low	0.28	1	5	1-2
	12	---	---	---	---	---	---	---			
Ayon	0-18	18-27	0.6-2.0	0.09-0.13	7.4-9.0	<2	Low	0.24	5	5	1-2
	18-60	20-33	0.6-2.0	0.04-0.08	7.9-9.0	<2	Low	0.20			
AB*:											
Apache	0-13	20-25	0.6-2.0	0.08-0.10	7.4-8.4	<2	Low	0.10	1	6	1-2
	13	---	---	---	---	---	---	---			
Rock outcrop.											
AC*:											
Apache	0-13	20-27	0.6-2.0	0.12-0.16	7.4-8.4	<2	Low	0.28	1	5	1-2
	13	---	---	---	---	---	---	---			
Rock outcrop.											
Ayon	0-6	18-27	0.6-2.0	0.09-0.13	7.4-9.0	<2	Low	0.24	5	6	1-2
	6-60	20-33	0.6-2.0	0.04-0.08	7.9-9.0	<2	Low	0.20			
AE*:											
Argiustolls.											
Rock outcrop.											
BA*:											
Barela	0-11	18-25	0.2-0.6	0.16-0.18	6.6-7.3	<2	Low	0.32	4	6	1-2
	11-26	35-45	0.2-0.6	0.19-0.21	6.6-7.3	<2	Moderate	0.37			
	26-45	35-50	0.06-0.2	0.11-0.13	6.6-7.3	<2	High	0.24			
	45	---	---	---	---	---	---	---			
Yankee	0-18	20-25	0.6-2.0	0.16-0.18	6.6-7.3	<2	Moderate	0.43	5	5	1-2
	18-60	35-55	0.06-0.2	0.14-0.16	6.6-8.4	<2	High	0.24			
BC*:											
Bernal	0-3	20-27	0.6-2.0	0.16-0.18	5.6-7.8	<2	Moderate	0.32	1	6	1-2
	3-14	20-30	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	0.32			
	14	---	---	---	---	---	---	---			
Rock outcrop.											
Carnero	0-6	15-25	0.2-6.0	0.15-0.19	6.6-8.4	<2	Low	0.32	2	6	1-2
	6-30	35-50	0.06-0.2	0.13-0.20	6.6-8.4	<2	High	0.24			
	30	---	---	---	---	---	---	---			
Bd Breece Variant	0-10	6-12	2.0-6.0	0.11-0.13	6.6-7.3	<2	Low	0.20	5	3	1-2
	10-60	8-16	2.0-6.0	0.12-0.16	6.6-7.8	<2	Low	0.24			
Be Brycan	0-8	15-20	0.6-2.0	0.15-0.18	7.4-7.8	<2	Low	0.32	5	5	2-4
	8-60	20-30	0.6-2.0	0.14-0.19	7.4-7.8	<2	Low	0.20			
Bf Brycan	0-15	15-20	0.6-2.0	0.15-0.18	7.4-7.8	<2	Low	0.32	5	5	2-4
	15-60	20-30	0.6-2.0	0.14-0.19	7.4-7.8	<2	Low	0.20			
BH*:											
Burnac	0-15	20-27	0.6-2.0	0.12-0.15	6.1-7.3	<2	Low	0.20	3	7	1-3
	15-40	35-50	<0.06	0.14-0.16	6.1-7.3	<2	High	0.32			
	40-50	40-50	0.06-0.2	0.08-0.10	6.6-7.8	<2	Moderate	0.15			
	50	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
BH*:											
Hillery----------	0-14	15-27	0.6-2.0	0.13-0.15	5.6-7.3	<2	Low--------	0.28	5	7	1-2
	14-60	50-60	<0.06	0.11-0.16	5.6-7.3	<2	High-------	0.24			
CA*:											
Capulin----------	0-3	18-27	0.6-2.0	0.14-0.19	6.6-7.8	<2	Moderate	0.28	3	4L	1-2
	3-35	18-35	0.6-2.0	0.12-0.21	7.9-8.4	<2	Moderate	0.24			
	35-60	20-30	0.6-2.0	0.08-0.21	7.4-9.0	<2	Moderate	0.20			
Charette---------	0-3	15-25	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low--------	0.37	5	5	1-2
	3-60	35-45	0.06-0.2	0.18-0.20	6.6-7.8	<2	Moderate	0.32			
Ayon-------------	0-13	18-27	0.6-2.0	0.09-0.13	7.4-9.0	<2	Low--------	0.24	5	5	1-2
	13-60	20-33	0.6-2.0	0.04-0.08	7.9-9.0	<2	Low--------	0.20			
Cb---------------	0-9	28-34	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.37	5	8	1-2
Ceboya	9-23	35-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.37			
	23-60	45-55	<0.06	0.14-0.16	7.4-8.4	<2	High-------	0.24			
CC*:											
Charette---------	0-12	15-25	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low--------	0.37	5	5	1-2
	12-51	35-45	0.06-0.2	0.18-0.20	6.6-7.8	<2	Moderate	0.32			
	51-70	25-35	0.2-0.6	0.15-0.17	7.4-8.4	<2	Moderate	0.37			
Capulin----------	0-12	18-27	0.6-2.0	0.14-0.19	6.6-7.8	<2	Low--------	0.28	3	4L	1-2
	12-60	18-35	0.6-2.0	0.12-0.21	7.9-8.4	<2	Moderate	0.24			
CD*--------------	0-10	20-27	0.2-0.6	0.16-0.18	7.4-8.4	<2	Low--------	0.43	5	4L	1-2
Colmor	10-32	24-35	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.49			
	32-60	17-27	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low--------	0.43			
Ce---------------	0-3	20-27	0.2-0.6	0.19-0.21	7.4-8.4	<2	Low--------	0.43	5	4L	1-2
Colmor	3-15	24-35	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.49			
	15-60	17-27	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low--------	0.43			
CF*:											
Crews------------	0-3	10-25	0.6-2.0	0.17-0.20	6.6-7.8	<2	Low--------	0.32	1	5	1-2
	3-14	35-50	0.2-0.6	0.14-0.20	6.6-7.8	<2	High-------	0.37			
	14	---	---	---	---	---	-----------	----			
Tricon-----------	0-4	20-27	0.2-2.0	0.19-0.21	6.6-7.8	<2	Low--------	0.32	2	6	1-2
	4-28	35-50	0.06-0.2	0.14-0.21	6.6-8.4	<2	High-------	0.28			
	28-40	28-35	0.2-0.6	0.13-0.15	6.6-8.4	<2	Moderate	0.28			
	40	---	---	---	---	---	-----------	----			
CN*:											
Cundiyo----------	0-5	5-10	2.0-6.0	0.07-0.09	6.1-7.3	<2	Low--------	0.10	3	5	2-4
	5-45	5-14	2.0-6.0	0.07-0.09	6.1-7.3	<2	Low--------	0.10			
	45-60	0-5	6.0-20	0.07-0.09	6.1-7.3	<2	Low--------	0.10			
Nambe Variant----	0-4	7-15	2.0-6.0	0.06-0.08	5.6-6.5	<2	Low--------	0.10	5	7	<1
	4-60	6-18	2.0-6.0	0.03-0.06	5.6-6.5	<2	Low--------	0.05			
DA*:											
Dalcan-----------	0-4	18-27	0.6-2.0	0.08-0.13	6.1-7.8	<2	Low--------	0.24	2	7	1-3
	4-28	35-45	0.06-0.2	0.05-0.10	6.1-7.8	<2	Moderate	0.28			
	28	---	---	---	---	---	-----------	----			
Raton------------	0-6	20-27	0.2-0.6	0.10-0.12	6.6-7.3	<2	Low--------	0.15	1	8	2-4
	6-12	40-55	0.06-0.2	0.08-0.09	6.6-7.3	<2	High-------	0.10			
	12	---	---	---	---	---	-----------	----			
DF*:											
Dargol-----------	0-6	15-27	0.6-2.0	0.13-0.15	5.6-6.5	<2	Low--------	0.24	3	7	1-2
	6-38	40-55	<0.06	0.14-0.16	5.6-6.5	<2	High-------	0.28			
	38	---	---	---	---	---	-----------	----			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
DP*:											
Puera	0-15	17-26	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low	0.20	4	7	1-2
	15-32	45-60	0.06-0.2	0.10-0.15	6.1-7.3	<2	High	0.20			
	32-60	45-60	0.06-0.2	0.08-0.12	6.1-7.3	<2	High	0.10			
DR*:											
Dargol	0-12	15-27	0.6-2.0	0.13-0.15	5.6-6.5	<2	Low	0.24	3	7	1-2
	12-27	40-55	<0.06	0.14-0.16	5.6-6.5	<2	High	0.28			
	27	---	---	---	---	---	---	---			
Rocio	0-14	15-25	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low	0.20	5	6	2-4
	14-60	45-60	0.06-0.2	0.15-0.17	6.1-7.3	<2	High	0.32			
Vamer	0-8	15-25	0.6-2.0	0.10-0.16	6.6-7.3	<2	Low	0.28	1	7	1-2
	8-17	40-55	0.06-0.2	0.11-0.18	6.6-7.3	<2	High	0.32			
	17	---	---	---	---	---	---	---			
DV*:											
Dargol	0-8	15-27	0.6-2.0	0.13-0.15	5.6-6.5	<2	Low	0.24	3	7	1-2
	8-35	40-55	<0.06	0.14-0.16	5.6-6.5	<2	High	0.28			
	35	---	---	---	---	---	---	---			
Rocio	0-15	15-25	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low	0.20	5	6	1-2
	15-65	45-60	0.06-0.2	0.15-0.17	6.1-7.3	<2	High	0.32			
Vamer	0-3	15-25	0.6-2.0	0.10-0.16	6.6-7.3	<2	Low	0.28	1	7	1-2
	3-16	40-55	0.06-0.2	0.11-0.18	6.6-7.3	<2	High	0.32			
	16	---	---	---	---	---	---	---			
EE*:											
Etoe	0-10	10-23	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low	0.20	3	6	1-3
	10-28	10-25	0.6-2.0	0.10-0.14	6.1-6.5	<2	Low	0.20			
	28-60	20-25	0.6-2.0	0.05-0.11	6.1-7.3	<2	Low	0.15			
Etown	0-11	10-20	0.6-2.0	0.09-0.12	6.1-6.5	<2	Low	0.20	5	6	1-2
	11-60	35-50	0.2-0.6	0.07-0.09	6.1-6.5	<2	Moderate	0.05			
ER*:											
Etoe	0-12	10-18	2.0-6.0	0.08-0.10	6.1-7.3	<2	Low	0.15	3	4	1-3
	12-24	10-25	0.6-2.0	0.10-0.14	6.1-6.5	<2	Low	0.20			
	24-60	20-25	0.6-2.0	0.05-0.11	6.1-7.3	<2	Low	0.15			
Rock outcrop.											
Rubble land.											
EV*:											
Eutroboralfs.											
Rock outcrop.											
Vamer	0-6	15-25	0.6-2.0	0.10-0.16	6.6-7.3	<2	Low	0.28	1	7	1-2
	6-12	40-55	0.06-0.2	0.11-0.18	6.6-7.3	<2	High	0.32			
	12	---	---	---	---	---	---	---			
FE*:											
Piro	0-7	10-18	2.0-6.0	0.09-0.11	6.1-7.8	<2	Low	0.15	1	4	2-4
	7-14	18-35	0.6-2.0	0.08-0.10	6.1-7.8	<2	Low	0.10			
	14	---	---	---	---	---	---	---			
Hesperus	0-18	8-18	2.0-6.0	0.12-0.14	6.1-7.8	<2	Low	0.20	5	3	2-4
	18-60	15-35	0.6-2.0	0.16-0.19	6.1-7.8	<2	Low	0.32			
FR*:											
Piro	0-3	18-27	0.6-2.0	0.08-0.10	6.1-7.8	<2	Low	0.10	1	8	2-4
	3-11	18-35	0.6-2.0	0.08-0.10	6.1-7.8	<2	Low	0.10			
	11	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
FR*:											
Rock outcrop.											
FU*:											
Fuera-----------	0-14	17-26	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low--------	0.20	4	7	1-2
	14-39	45-60	0.06-0.2	0.10-0.15	6.1-7.3	<2	High-------	0.20			
	39-60	45-60	0.06-0.2	0.08-0.12	6.1-7.3	<2	High-------	0.10			
Dargol----------	0-13	15-27	0.6-2.0	0.13-0.15	5.6-6.5	<2	Low--------	0.24	3	7	1-2
	13-37	40-55	<0.06	0.14-0.16	5.6-6.5	<2	High-------	0.28			
	37	---	---	---	---	---	-----------	----			
HA*:											
Haplustolls.											
Rock outcrop.											
Hb---------------	0-12	8-18	2.0-6.0	0.12-0.14	6.1-7.8	<2	Low--------	0.20	5	3	2-4
Hesperus	12-33	18-35	0.2-0.6	0.16-0.19	6.1-7.8	<2	Low--------	0.32			
	33-64	15-35	0.6-2.0	0.16-0.19	6.1-7.8	<2	Low--------	0.32			
Hc---------------	0-10	8-18	2.0-6.0	0.12-0.14	6.1-7.8	<2	Low--------	0.20	5	3	2-4
Hesperus	10-32	18-35	0.6-2.0	0.16-0.19	6.1-7.8	<2	Low--------	0.32			
	32-60	15-35	0.6-2.0	0.16-0.19	6.1-7.8	<2	Low--------	0.32			
Ho*:											
Holman----------	0-10	5-10	2.0-6.0	0.04-0.06	6.1-7.3	<2	Low--------	0.17	5	4L	1-3
	10-14	4-8	6.0-20	0.04-0.06	6.1-7.3	<2	Low--------	0.10			
	14-60	2-6	>20	0.02-0.04	6.6-7.8	<2	Low--------	0.05			
Holman----------	0-12	5-10	6.0-20	0.02-0.04	6.1-7.3	<2	Low--------	0.10	5	5	1-3
	12-60	2-6	>20	0.02-0.04	6.6-7.8	<2	Low--------	0.05			
Ka---------------	0-21	9-15	2.0-6.0	0.10-0.14	7.4-8.4	<2	Low--------	0.24	3	3	1-3
Kinesava	21-75	35-60	0.06-0.2	0.14-0.20	7.4-8.4	<2	High-------	0.20			
Kb---------------	0-29	15-27	0.6-2.0	0.16-0.18	7.4-8.4	<2	Moderate	0.37	3	6	1-3
Kinesava	29-70	35-60	0.06-0.2	0.14-0.20	7.4-8.4	<2	High-------	0.20			
KR*:											
Krakon----------	0-6	28-32	0.2-0.6	0.16-0.18	6.6-7.8	<2	Moderate	0.32	2	6	2-4
	6-14	24-34	0.2-0.6	0.14-0.16	6.6-7.8	<2	Moderate	0.37			
	14	---	---	---	---	---	-----------	----			
Rock outcrop.											
La---------------	0-6	27-35	0.2-0.6	0.19-0.21	6.6-8.4	<2	Moderate	0.32	5	7	2-3
La Brier	6-36	35-60	<0.06	0.16-0.20	7.4-8.4	<2	High-------	0.32			
	36-60	30-40	0.06-0.2	0.19-0.21	7.9-8.4	<2	Moderate	0.37			
LM*:											
Litle-----------	0-6	30-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.37	3	4L	.5-.9
	6-36	38-55	<0.06	0.14-0.19	7.9-8.4	2-8	High-------	0.32			
	36	---	---	---	---	---	-----------	----			
Mion------------	0-4	27-35	0.6-2.0	0.19-0.21	7.4-8.4	<2	Moderate	0.37	2	4L	.3-.5
	4-15	40-55	<0.06	0.15-0.17	7.4-8.4	<2	High-------	0.32			
	15	---	---	---	---	---	-----------	----			
MA*:											
Maes------------	0-24	18-26	2.0-6.0	0.11-0.15	6.6-7.3	<2	Low--------	0.20	3	7	.5-.9
	24-60	30-45	0.2-0.6	0.07-0.09	6.1-6.5	<2	Moderate	0.10			
Etoe------------	0-6	10-18	2.0-6.0	0.05-0.07	6.1-7.3	<2	Low--------	0.10	3	5	1-3
	6-33	10-25	0.6-2.0	0.10-0.14	6.1-6.5	<2	Low--------	0.20			
	33-60	20-25	0.6-2.0	0.05-0.11	6.1-7.3	<2	Low--------	0.15			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
[illegible]*:											
Maes	0-17	20-26	2.0-6.0	0.07-0.09	6.6-7.3	<2	Low	0.10	3	8	.5-.9
	17-60	25-45	0.2-0.6	0.07-0.09	6.1-6.5	<2	Moderate	0.10			
Etoe	0-5	10-23	0.6-2.0	0.12-0.14	6.1-7.3	<2	Low	0.20	3	6	1-3
	5-32	10-25	0.6-2.0	0.10-0.14	6.1-6.5	<2	Low	0.20			
	32-60	18-25	0.6-2.0	0.05-0.11	6.1-7.3	<2	Low	0.15			
[illegible] Manzano	0-9	10-25	0.6-2.0	0.16-0.18	6.6-7.8	<2	Low	0.28	5	6	2-3
	9-60	18-34	0.2-0.6	0.16-0.21	7.4-8.4	<2	Moderate	0.32			
[illegible]*:											
Mion	0-4	18-27	0.2-0.6	0.10-0.12	7.9-8.4	<2	Low	0.28	2	6	.5-.9
	4-14	40-55	<0.06	0.10-0.13	7.9-8.4	<2	High	0.20			
	14	---	---	---	---	---	----------	----			
Litle	0-6	30-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.37	3	4L	.5-.9
	6-32	38-55	<0.06	0.14-0.19	7.9-8.4	2-8	High	0.32			
	32	---	---	---	---	---	----------	----			
Rock outcrop.											
[illegible]*:											
Mion	0-4	18-27	0.2-0.6	0.12-0.14	7.9-8.4	<2	Low	0.32	2	5	.5-.9
	4-16	40-55	<0.06	0.10-0.13	7.9-8.4	<2	High	0.20			
	16	---	---	---	---	---	----------	----			
Litle	0-5	30-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.37	3	4L	.5-.9
	5-36	38-55	<0.06	0.14-0.19	7.9-8.4	2-8	High	0.32			
	36	---	---	---	---	---	----------	----			
Rock outcrop.											
[illegible]*:											
Mion	0-4	18-27	0.2-0.6	0.10-0.12	7.9-8.4	<2	Low	0.28	2	6	.5-.9
	4-16	40-55	<0.06	0.10-0.13	7.9-8.4	<2	High	0.20			
	16	---	---	---	---	---	----------	----			
Penrose Variant	0-8	10-14	0.6-2.0	0.07-0.10	7.9-8.4	<2	Low	0.28	2	6	.5-.9
	8-18	14-24	0.6-2.0	0.07-0.10	7.9-8.4	<2	Low	0.28			
	18	---	---	---	---	---	----------	----			
Rock outcrop.											
[illegible]*:											
Mion	0-3	18-27	0.2-0.6	0.12-0.14	7.9-8.4	<2	Low	0.32	2	5	.5-.9
	3-12	40-55	<0.06	0.10-0.13	7.9-8.4	<2	High	0.20			
	12	---	---	---	---	---	----------	----			
Penrose Variant	0-4	10-14	0.6-2.0	0.10-0.12	7.4-8.4	<2	Low	0.32	2	5	.5-.9
	4-11	14-24	0.6-2.0	0.07-0.10	7.9-8.4	<2	Low	0.28			
	11	---	---	---	---	---	----------	----			
Rock outcrop.											
[illegible] Moreno	0-10	18-27	0.6-2.0	0.14-0.17	6.6-7.3	<2	Low	0.24	5	6	1-2
	10-60	35-50	0.06-0.2	0.16-0.20	6.6-7.3	<2	Moderate	0.28			
[illegible] Moreno	0-11	18-27	0.6-2.0	0.14-0.17	6.6-7.3	<2	Low	0.24	5	6	1-2
	11-60	35-50	0.06-0.2	0.16-0.20	6.6-7.3	<2	Moderate	0.28			
[illegible]*:											
Moreno	0-13	20-30	0.6-2.0	0.15-0.18	6.6-7.3	<2	Low	0.24	5	5	1-2
	13-60	33-50	0.06-0.2	0.16-0.20	6.6-7.3	<2	Moderate	0.28			
Brycan	0-16	15-20	0.6-2.0	0.15-0.18	7.4-7.8	<2	Low	0.32	5	5	2-4
	16-60	20-30	0.2-0.8	0.14-0.19	7.4-7.8	<2	Low	0.20			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors K	Erosion factors T	Wind erodibility group	Organic matter
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
NR*:											
Nambe Variant	0-10	6-15	2.0-6.0	0.06-0.08	5.6-6.5	<2	Low	0.10	5	6	<1
	10-60	6-15	2.0-6.0	0.06-0.08	5.6-6.5	<2	Low	0.07			
Rock outcrop.											
Rubble land.											
Pa Partri	0-3	18-27	0.6-2.0	0.16-0.21	6.6-8.4	<2	Low	0.37	5	6	1-3
	3-30	35-55	0.06-0.2	0.14-0.21	6.6-8.4	<2	High	0.32			
	30-60	25-40	0.2-0.6	0.15-0.17	7.9-8.4	<2	Moderate	0.28			
PB* Partri	0-2	18-27	0.6-2.0	0.16-0.21	6.6-8.4	<2	Low	0.37	5	6	1-3
	2-60	35-55	0.06-0.2	0.14-0.21	6.6-8.4	<2	High	0.32			
PC*:											
Partri	0-3	18-27	0.6-2.0	0.16-0.21	6.6-8.4	<2	Low	0.37	5	6	1-3
	3-35	40-55	0.06-0.2	0.14-0.21	6.6-8.4	<2	High	0.32			
	35-60	25-40	0.2-0.6	0.15-0.17	7.9-8.4	<2	Moderate	0.28			
Carnero	0-9	15-25	0.2-6.0	0.15-0.19	6.6-8.4	<2	Low	0.32	2	6	1-2
	9-28	35-50	0.06-0.2	0.13-0.20	6.6-8.4	<2	High	0.24			
	28	---	---	---	---	---	---	---			
Bernal	0-9	20-27	0.6-2.0	0.18-0.21	5.6-7.8	<2	Moderate	0.32	1	6	1-2
	9-19	20-30	0.6-2.0	0.16-0.18	6.6-7.8	<2	Moderate	0.32			
	19	---	---	---	---	---	---	---			
PM*:											
Penrose	0-19	15-27	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low	0.17	1	5	.5-1
	19	---	---	---	---	---	---	---			
Mion	0-10	27-34	0.2-0.6	0.12-0.14	7.9-8.4	<2	Low	0.32	2	5	.5-.9
	10-15	40-55	<0.06	0.10-0.13	7.9-8.4	<2	High	0.20			
	15	---	---	---	---	---	---	---			
Litle	0-3	30-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.37	3	4L	.5-.9
	3-30	38-55	<0.06	0.14-0.19	7.9-8.4	2-8	High	0.32			
	30	---	---	---	---	---	---	---			
PT*:											
Pidineen	0-7	15-22	0.6-2.0	0.14-0.16	7.9-8.4	<2	Low	0.28	1	5	1-2
	7-13	15-30	0.6-2.0	0.18-0.20	7.9-8.4	<2	Low	0.32			
	13-16	15-25	0.6-2.0	0.13-0.15	7.9-8.4	<2	Low	0.20			
	16	---	---	---	---	---	---	---			
Tricon	0-2	20-27	0.2-2.0	0.16-0.18	6.6-7.8	<2	Low	0.32	2	6	1-2
	2-20	35-50	0.06-0.2	0.14-0.21	6.6-8.4	<2	High	0.28			
	20-28	28-35	0.2-0.6	0.13-0.15	6.6-8.4	<2	Moderate	0.28			
	28	---	---	---	---	---	---	---			
RB*:											
Raton	0-9	20-27	0.2-0.6	0.10-0.12	6.6-7.3	<2	Low	0.20	1	8	2-4
	9-15	40-55	0.06-0.2	0.08-0.09	6.6-7.3	<2	High	0.10			
	15	---	---	---	---	---	---	---			
Barela	0-13	18-25	0.2-0.6	0.19-0.21	6.6-7.3	<2	Low	0.32	4	6	1-2
	13-31	35-45	0.2-0.6	0.19-0.21	6.6-7.3	<2	Moderate	0.37			
	31-44	35-50	0.06-0.2	0.11-0.13	6.6-7.3	<2	High	0.24			
	44	---	---	---	---	---	---	---			
RD*:											
Raton	0-6	20-27	0.2-0.6	0.10-0.12	6.6-7.3	<2	Low	0.15	1	8	2-4
	6-15	40-55	0.06-0.2	0.08-0.09	6.6-7.3	<2	High	0.10			
	15	---	---	---	---	---	---	---			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodibility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
RD*:											
Dalcan----------	0-5	18-27	0.6-2.0	0.08-0.13	6.1-7.8	<2	Low-------	0.24	2	7	1-3
	5-35	35-45	0.06-0.2	0.05-0.10	6.1-7.8	<2	Moderate	0.28			
	35	---	---	---	---	---	----------	----			
RE*:											
Raton-----------	0-4	20-27	0.2-0.6	0.10-0.12	6.6-7.3	<2	Low-------	0.20	1	8	2-4
	4-10	35-55	0.06-0.2	0.08-0.09	6.6-7.3	<2	High------	0.10			
	10	---	---	---	---	---	----------	----			
Rock outcrop.											
Rf-------------- Remunda	0-10	18-27	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low-------	0.28	5	6	1-2
	10-40	35-50	0.06-0.2	0.16-0.19	6.6-8.4	<2	High------	0.28			
	40-60	25-35	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.28			
Rh-------------- Remunda	0-12	28-35	0.2-0.6	0.19-0.21	6.6-8.4	<2	Moderate	0.32	5	6	1-2
	12-38	35-50	0.06-0.2	0.16-0.19	6.6-8.4	<2	High------	0.28			
	38-60	25-35	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.28			
RL*:											
Remunda---------	0-15	18-27	0.6-2.0	0.16-0.18	6.6-8.4	<2	Low-------	0.28	5	6	1-2
	15-52	35-50	0.06-0.2	0.16-0.19	6.6-8.4	<2	High------	0.28			
	52-60	25-35	0.6-2.0	0.17-0.20	6.6-8.4	<2	Moderate	0.28			
Lavate Variant--	0-10	16-22	0.6-2.0	0.16-0.18	7.9-8.4	<2	Low-------	0.28	5	5	2-4
	10-60	28-34	0.2-0.6	0.14-0.19	7.9-8.4	<2	Moderate	0.24			
RO*: Rock outcrop.											
Bernal----------	0-3	16-22	0.6-2.0	0.12-0.14	7.9-8.4	<2	Low-------	0.28	1	6	1-2
	3-10	27-34	0.6-2.0	0.14-0.16	7.9-8.4	<2	Moderate	0.24			
	10	---	---	---	---	---	----------	----			
SA*:											
Sombordoro------	0-3	10-18	2.0-6.0	0.09-0.11	7.4-8.4	<2	Low-------	0.37	1	5	1-2
	3-14	35-55	0.06-0.6	0.04-0.11	7.4-8.4	<2	High------	0.24			
	14	---	---	---	---	---	----------	----			
Rock outcrop.											
Tuloso----------	0-2	10-20	0.6-2.0	0.07-0.09	6.6-8.4	<2	Low-------	0.10	1	7	.5-.9
	2-17	10-20	0.6-2.0	0.07-0.09	6.6-8.4	<2	Low-------	0.10			
	17	---	---	---	---	---	----------	----			
SB*:											
Sombordoro------	0-9	10-18	2.0-6.0	0.09-0.11	7.4-8.4	<2	Low-------	0.37	1	5	1-2
	9-18	35-55	0.06-0.6	0.04-0.11	7.4-8.4	<2	High------	0.24			
	18	---	---	---	---	---	----------	----			
Rock outcrop.											
Tuloso----------	0-4	10-20	0.6-2.0	0.07-0.09	6.6-8.4	<2	Low-------	0.10	1	5	.5-.9
	4-10	10-20	0.6-2.0	0.07-0.09	6.6-8.4	<2	Low-------	0.10			
	10	---	---	---	---	---	----------	----			
SM*:											
Spud------------	0-22	15-25	0.6-2.0	0.08-0.10	6.1-7.3	<2	Low-------	0.15	5	8	1-3
	22-49	35-55	<0.06	0.15-0.17	6.1-7.3	<2	High------	0.32			
	49-68	35-45	0.06-0.2	0.13-0.15	6.6-7.8	<2	High------	0.20			
	68-78	30-40	0.2-0.6	0.07-0.09	6.6-7.8	<2	Moderate	0.15			
Burnac----------	0-15	20-27	0.6-2.0	0.12-0.15	6.1-7.3	<2	Low-------	0.20	3	7	1-3
	15-37	35-50	<0.06	0.14-0.16	6.1-7.3	<2	High------	0.32			
	37-60	40-50	0.06-0.2	0.08-0.10	6.6-7.8	<2	Moderate	0.15			
	60	---	---	---	---	---	----------	----			

See footnote at end of table.

TABLE 12.--PHYSICAL AND CHEMICAL PROPERTIES OF SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Salinity	Shrink-swell potential	Erosion factors		Wind erodi-bility group	Organic matter
								K	T		
	In	Pct	In/hr	In/in	pH	Mmhos/cm					Pct
SW*---------------	0-5	18-25	0.2-0.6	0.19-0.21	6.6-7.3	<2	Low-------	0.37	5	6	1-2
Swastika	5-10	30-40	0.2-0.6	0.19-0.21	6.6-7.3	<2	Moderate	0.37			
	10-33	35-50	0.06-0.2	0.15-0.17	7.4-8.4	<2	High------	0.32			
	33-60	30-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.43			
Sx----------------	0-8	27-35	0.2-0.6	0.19-0.21	6.6-7.3	<2	Moderate	0.37	5	7	1-2
Swastika	8-25	40-50	0.06-0.2	0.15-0.17	7.4-8.4	<2	High------	0.32			
	25-60	25-40	0.2-0.6	0.19-0.21	7.4-8.4	<2	Moderate	0.43			
TA*---------------	0-10	15-25	0.6-2.0	0.10-0.14	7.4-7.8	<2	Low-------	0.10	5	7	.5-.9
Tinaja	10-25	18-30	0.6-2.0	0.04-0.10	7.4-8.4	<2	Low-------	0.10			
	25-68	5-18	6.0-20	0.01-0.04	7.4-8.4	<2	Low-------	0.10			
TT*:											
Torreon----------	0-2	14-22	0.6-2.0	0.16-0.21	6.6-7.3	<2	Low-------	0.28	5	6	1-2
	2-12	35-40	0.2-0.6	0.19-0.21	6.6-7.8	<2	High------	0.24			
	12-60	35-55	0.06-0.2	0.14-0.18	6.6-7.8	<2	High------	0.24			
Thunderbird------	0-2	20-27	0.2-0.6	0.11-0.12	6.6-7.8	<2	Low-------	0.10	2	7	1-2
	2-36	35-55	<0.06	0.14-0.16	7.4-8.4	<2	High------	0.24			
	36	---	---	---	---	---	----------	----			
US. Ustifluvents											
VA*:											
Vamer------------	0-4	15-25	0.6-2.0	0.10-0.16	6.6-7.3	<2	Low-------	0.28	1	7	1-2
	4-14	40-55	0.06-0.2	0.11-0.18	6.6-7.3	<2	High------	0.32			
	14	---	---	---	---	---	----------	----			
Rock outcrop.											
Eutroboralfs.											
Ve----------------	0-2	30-40	0.2-0.6	0.19-0.21	7.9-9.0	>2	Moderate	0.32	5	4L	.5-.7
Vermejo	2-60	40-55	<0.06	0.15-0.17	7.9-9.0	>2	High------	0.32			
VK*:											
Vermejo----------	0-2	30-40	0.2-0.6	0.19-0.21	7.9-9.0	>2	Moderate	0.32	5	4L	.5-.7
	2-60	40-55	<0.06	0.15-0.17	7.9-9.0	>2	High------	0.32			
Karde------------	0-3	10-20	2.0-6.0	0.13-0.15	7.9-8.4	2-8	Low-------	0.28	5	3	.5-1
	3-60	20-35	0.6-2.0	0.13-0.17	7.9-8.4	2-8	Low-------	0.37			
YS*:											
Yankee-----------	0-16	20-25	0.6-2.0	0.16-0.18	6.6-7.3	<2	Moderate	0.43	5	5	1-2
	16-60	35-55	0.06-0.2	0.14-0.16	6.6-8.4	<2	High------	0.24			
Saladon----------	0-4	35-40	0.2-0.6	0.19-0.21	6.6-7.3	<2	Moderate	0.37	5	8	15-20
	4-60	35-50	<0.06	0.15-0.17	6.6-7.3	<2	High------	0.24			

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 13.--SOIL AND WATER FEATURES

["Flooding" and terms such as "rare" and "long" are explained in the text. The symbol > means more than. Absence of an entry indicates that the feature is not a concern]

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
AA*:											
Apache	D	None	---	---	5-18	Hard	---	---	Moderate	High	Low.
Ayon	B	None	---	---	>60	---	---	---	Moderate	High	Low.
AB*:											
Apache	D	None	---	---	5-18	Hard	---	---	Moderate	High	Low.
Rock outcrop.											
AC*:											
Apache	D	None	---	---	5-18	Hard	---	---	Moderate	High	Low.
Rock outcrop.											
Ayon	B	None	---	---	>60	---	---	---	Moderate	High	Low.
AG*:											
Argiustolls.											
Rock outcrop.											
BA*:											
Barela	C	None	---	---	40-60	Hard	---	---	Moderate	High	Low.
Yankee	C	None	---	---	>60	---	---	---	Moderate	High	Low.
BC*:											
Bernal	D	None	---	---	10-19	Hard	---	---	Moderate	Moderate	Moderate.
Rock outcrop.											
Carnero	C	None	---	---	25-35	Hard	---	---	Moderate	High	Low.
Bd Breece Variant	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Be, Bf Brycan	B	None	---	---	>60	---	---	---	Moderate	High	Moderate.
BH*:											
Burnac	D	None	---	---	40-60	Hard	---	---	Moderate	Moderate	Low.
Hillery	D	None	---	---	>60	Hard	---	---	Moderate	High	High.
CA*:											
Capulin	B	None	---	---	>60	---	---	---	Moderate	High	Low.
Charette	C	None	---	---	>60	---	---	---	Low	High	Low.
Ayon	B	None	---	---	>60	---	---	---	Moderate	High	Low.
Cb Ceboya	D	Frequent	Long	May-Sep	>60	---	---	---	Moderate	Moderate	Low.
CC*:											
Charette	C	None	---	---	>60	---	---	---	Low	High	Low.
Capulin	B	None	---	---	>60	---	---	---	Moderate	High	Low.
CD*, Ce Colmor	B	None	---	---	>60	---	---	---	Moderate	High	Low.
CF*:											
Crews	D	None	---	---	>60	---	10-19	Thick	Low	High	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
CF*: Tricon	C	None	---	---	>60	---	20-40	Thick	Low	High	Low.
CN*: Cundiyo	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Nambe Variant	B	None	---	---	>60	---	---	---	Moderate	Moderate	Moderate.
DA*: Dalcan	C	None	---	---	20-40	Hard	---	---	Moderate	High	Moderate.
Raton	D	None	---	---	10-20	Hard	---	---	Moderate	Moderate	Low.
DF*: Dargol	D	None	---	---	20-40	Hard	---	---	Moderate	Moderate	Moderate.
Fuera	C	None	---	---	>60	---	---	---	Low	Moderate	Low.
DR*, DV*: Dargol	D	None	---	---	20-40	Hard	---	---	Moderate	Moderate	Moderate.
Rocio	C	None	---	---	>60	---	---	---	Low	Moderate	Low.
Vamer	D	None	---	---	7-20	Hard	---	---	Moderate	High	Low.
EE*: Etoe	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Etown	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
ER*: Etoe	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Rock outcrop.											
Rubble land.											
EV*: Eutroboralfs.											
Rock outcrop.											
Vamer	D	None	---	---	7-20	Hard	---	---	Moderate	High	Low.
FH*: Firo	D	None	---	---	7-20	Hard	---	---	Moderate	Moderate	Low.
Hesperus	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
FR*: Firo	D	None	---	---	7-20	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											
FU*: Fuera	C	None	---	---	>60	---	---	---	Low	Moderate	Low.
Dargol	D	None	---	---	20-40	Hard	---	---	Moderate	Moderate	Moderate.
HA*: Haplustolls.											
Rock outcrop.											
Hb, Hc Hesperus	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Ho*: Holman	A	Rare	---	---	>60	---	---	---	Low	Moderate	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydro-logic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hard-ness	Depth	Hard-ness		Uncoated steel	Concrete
					In		In				
Ho*:											
Holman	A	Rare	---	---	>60	---	---	---	Low	Moderate	Low.
Ka, Kb Kinesava	B	None	---	---	>60	Hard	---	---	Moderate	Moderate	Low.
KR*:											
Krakon	D	None	---	---	8-20	Soft	---	---	Moderate	Moderate	Low.
Rock outcrop.											
La La Brier	D	Rare	---	---	>60	---	---	---	Low	High	Low.
LM*:											
Litle	D	None	---	---	20-40	Soft	---	---	Low	High	Moderate.
Mion	D	None	---	---	10-20	Soft	---	---	Low	High	Low.
MA*, MB*:											
Maes	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Etoe	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Mc Manzano	B	Rare	---	---	>60	---	---	---	Moderate	High	Low.
MD*, ME*:											
Mion	D	None	---	---	10-20	Soft	---	---	Low	Moderate	Low.
Litle	D	None	---	---	20-40	Soft	---	---	Low	High	Moderate.
Rock outcrop.											
MF*, MG*:											
Mion	D	None	---	---	10-20	Soft	---	---	Low	Moderate	Low.
Penrose Variant	D	None	---	---	10-20	Soft	---	---	Low	Moderate	Low.
Rock outcrop.											
Mh, Mo Moreno	C	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
MP*:											
Moreno	C	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Brycan	B	None	---	---	>60	---	---	---	Moderate	High	Moderate.
MR*:											
Kambe Variant	B	None	---	---	>60	---	---	---	Moderate	Moderate	Moderate.
Rock outcrop.											
Rubble land.											
Pa, PB* Partri	C	None	---	---	>60	---	---	---	Low	High	Low.
PC*:											
Partri	C	None	---	---	>60	---	---	---	Low	High	Low.
Carnero	C	None	---	---	25-35	Hard	---	---	Moderate	High	Low.
Bernal	D	None	---	---	10-19	Hard	---	---	Moderate	Moderate	Moderate.
PM*:											
Penrose	D	None	---	---	10-20	Soft	---	---	Low	High	Low.
Mion	D	None	---	---	10-20	Soft	---	---	Low	Moderate	Low.

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
PM*:											
Litle	D	None	---	---	20-40	Soft	---	---	Low	High	Moderate.
PT*:											
Pidineen	D	None	---	---	>60	---	10-20	Thick	Low	High	Low.
Tricon	C	None	---	---	>60	---	20-40	Thick	Low	High	Low.
RB*:											
Raton	D	None	---	---	10-20	Hard	---	---	Moderate	Moderate	Low.
Barela	C	None	---	---	40-60	Hard	---	---	Moderate	High	Low.
RD*:											
Raton	D	None	---	---	10-20	Hard	---	---	Moderate	Moderate	Low.
Dalcan	C	None	---	---	20-40	Hard	---	---	Moderate	High	Moderate.
RE*:											
Raton	D	None	---	---	10-20	Hard	---	---	Moderate	Moderate	Low.
Rock outcrop.											
Rf, Rh Remunda	C	None	---	---	>60	---	---	---	Low	Moderate	Low.
RL*:											
Remunda	C	None	---	---	>60	---	---	---	Low	Moderate	Low.
Lavate Variant	B	None	---	---	>60	---	---	---	Moderate	High	Low.
RO*:											
Rock outcrop.											
Bernal	D	None	---	---	10-19	Hard	---	---	Moderate	High	Low.
SA*, SB*:											
Sombordoro	D	None	---	---	6-18	Hard	---	---	Low	High	Low.
Rock outcrop.											
Tuloso	D	None	---	---	10-20	Hard	---	---	Moderate	Moderate	Low.
SM*:											
Spud	C	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
Burnac	D	None	---	---	40-60	Hard	---	---	Moderate	Moderate	Low.
SW*, Sx Swastika	C	None	---	---	>60	---	---	---	Low	High	Low.
TA* Tinaja	B	None	---	---	>60	---	---	---	Moderate	Moderate	Low.
TT*:											
Torreon	C	None	---	---	>60	---	---	---	Low	High	Low.
Thunderbird	D	None	---	---	20-40	Hard	---	---	Low	High	Low.
US. Ustifluvents											
VA*:											
Vamer	D	None	---	---	7-20	Hard	---	---	Moderate	High	Low.
Rock outcrop.											
Eutroboralfs.											

See footnote at end of table.

TABLE 13.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			Bedrock		Cemented pan		Potential frost action	Risk of corrosion	
		Frequency	Duration	Months	Depth	Hardness	Depth	Hardness		Uncoated steel	Concrete
					In		In				
Ve Vermejo	D	Rare	---	---	>60	---	---	---	Low	High	High.
VX*:											
Vermejo	D	Rare	---	---	>60	---	---	---	Low	High	High.
Karde	B	None	---	---	>60	---	---	---	Low	High	Low.
YS*:											
Yankee	C	None	---	---	>60	---	---	---	Moderate	High	Low.
Saladon	D	Frequent	Long	Jun-Sep	>60	---	---	---	Moderate	Moderate	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Apache	Loamy, mixed, mesic Lithic Haplustolls
Argiustolls	Argiustolls
Ayon	Loamy-skeletal, mixed, mesic Aridic Calciustolls
Barela	Fine, mixed Typic Argiborolls
Bernal	Loamy, mixed, mesic Lithic Argiustolls
Breece Variant	Coarse-loamy, mixed Cumulic Haploborolls
Brycan	Fine-loamy, mixed Cumulic Haploborolls
Burrac	Fine, montmorillonitic Mollic Eutroboralfs
Capulin	Fine-loamy, mixed, mesic Aridic Argiustolls
Carnero	Fine, mixed, mesic Aridic Argiustolls
Ceboya	Fine, mixed, frigid Typic Haplaquolls
Charette	Fine, mixed, mesic Aridic Argiustolls
Colmor	Fine-silty, mixed, mesic Torriorthentic Haplustolls
Crews	Clayey, mixed, mesic, shallow Petrocalcic Paleustolls
*Cundiyo	Loamy-skeletal, mixed Typic Cryoboralfs
Dalcan	Clayey-skeletal, montmorillonitic Pachic Argiborolls
Dargol	Fine, mixed Typic Eutroboralfs
Etoe	Loamy-skeletal, mixed Typic Paleboralfs
Etown	Clayey-skeletal, mixed Typic Eutroboralfs
Eutroboralfs	Eutroboralfs
Firo	Loamy-skeletal, mixed Lithic Haploborolls
Fuera	Fine, mixed Typic Eutroboralfs
Haplustolls	Haplustolls
Hesperus	Fine-loamy, mixed Pachic Argiborolls
Hillery	Fine, montmorillonitic Pachic Argiborolls
Holman	Sandy-skeletal, mixed Entic Haploborolls
Karde	Fine-silty, carbonatic, mesic Ustic Torriorthents
*Kinesava	Fine, mixed Pachic Paleborolls
Krakon	Loamy, mixed, nonacid, frigid, shallow Typic Ustorthents
La Brier	Fine, mixed, mesic Torrertic Argiustolls
Lavate Variant	Fine-loamy, mixed, mesic Aridic Argiustolls
Litle	Fine, mixed, mesic Ustollic Camborthids
Maes	Clayey-skeletal, mixed Eutric Glossoboralfs
Manzano	Fine-loamy, mixed, mesic Cumulic Haplustolls
Mion	Clayey, mixed (calcareous), mesic, shallow Ustic Torriorthents
Moreno	Fine, mixed Typic Argiborolls
Nambe Variant	Loamy-skeletal, mixed Typic Cryochrepts
Partri	Fine, mixed, mesic Aridic Argiustolls
Penrose	Loamy, carbonatic, mesic Lithic Ustic Torriorthents
Penrose Variant	Loamy-skeletal, mixed, (calcareous), mesic Lithic Ustic Torriorthents
Pidineen	Loamy, mixed, mesic, shallow Petrocalcic Calciustolls
Raton	Clayey-skeletal, mixed Lithic Argiborolls
Remunda	Fine, mixed, mesic Aridic Argiustolls
Rocio	Fine, mixed Mollic Eutroboralfs
Saladon	Fine, montmorillonitic Typic Cryaquolls
Sombordoro	Clayey-skeletal, mixed, mesic Lithic Haplustalfs
Spud	Fine, montmorillonitic Mollic Eutroboralfs
Swastika	Fine, mixed, mesic Aridic Argiustolls
Thunderbird	Fine, montmorillonitic, mesic Aridic Argiustolls
Tinaja	Loamy-skeletal, mixed, mesic Aridic Ustochrepts
Torreon	Fine, montmorillonitic, mesic Aridic Argiustolls
Tricon	Fine, mixed, mesic Petrocalcic Paleustolls
Tuloso	Loamy-skeletal, mixed, mesic Lithic Ustochrepts
Ustifluvents	Ustifluvents
Vamer	Clayey, mixed Lithic Eutroboralfs
Vermejo	Fine, mixed (calcareous), mesic Ustic Torriorthents
Yankee	Fine, mixed Vertic Argiborolls

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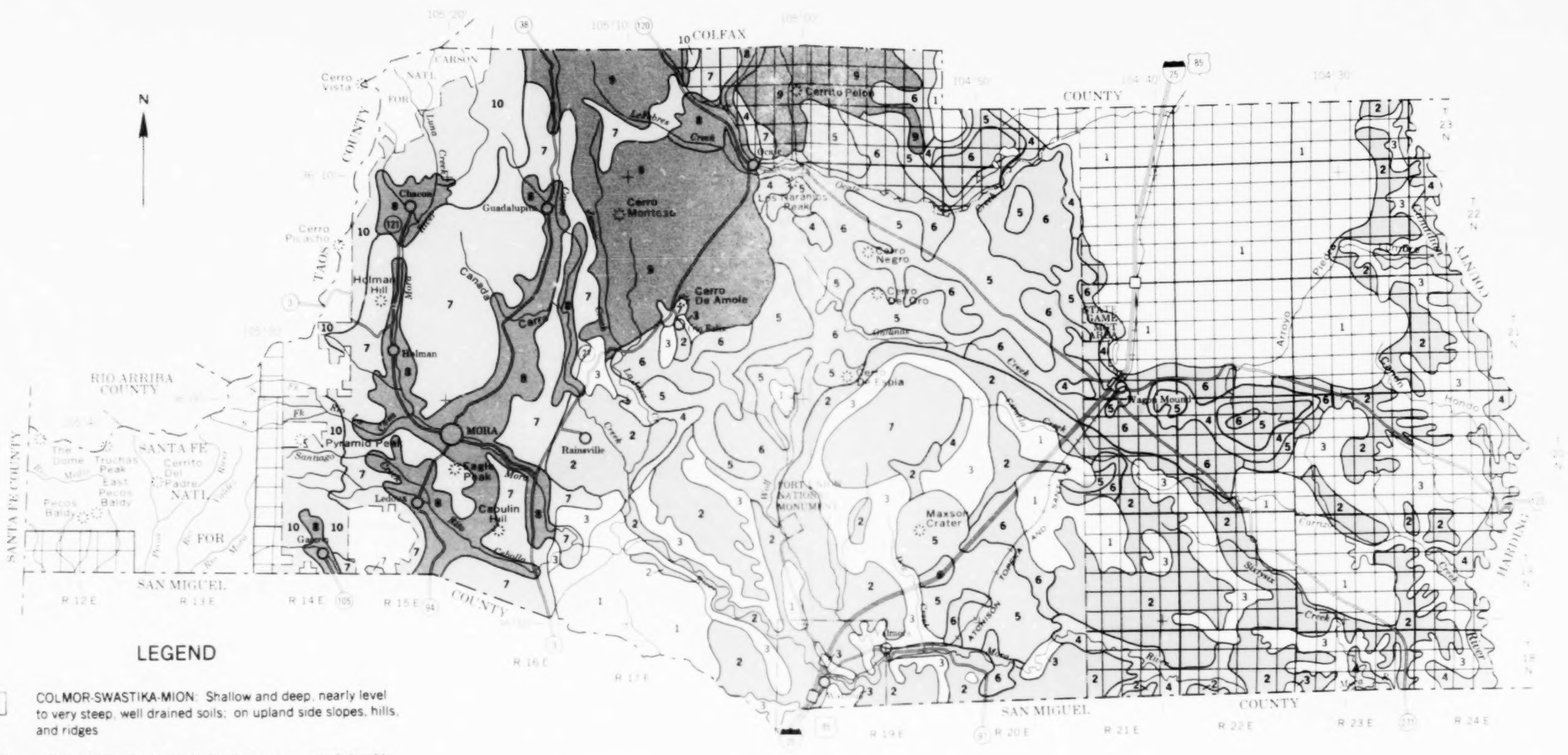

N
COLFAX COUNTY
CARSON NATL FOR
TAOS COUNTY
RIO ARRIBA COUNTY
SANTA FE COUNTY
SANTA FE NATL FOR
SAN MIGUEL COUNTY
HARDING COUNTY
Cerro Vista
Cerro Picacho
Chacon
Holman Hill
Holman
Guadalupita
Cerro Montoso
Cerro Pelon
Ocate
Los Naranjos Peak
Cerro Negro
Cerro Del Oro
Cerro De Amole
Cerro De Fopia
STATE GAME MGT AREA
Wagon Mound
MORA
Pyramid Peak
Eagle Peak
Capulin Hill
Ledoux
Rainsville
FORT UNION NATIONAL MONUMENT
Maxson Crater
Watrous
The Dome
Truchas Peak
East Pecos Baldy
Pecos Baldy
Cerrito Del Padre
Luna Creek
Coyote Creek
Le Febres Creek
Ocate Creek
Mora River
Sapello Creek
Canadian River
Santiago
R 12 E
R 13 E
R 14 E
R 15 E
R 16 E
R 17 E
R 19 E
R 20 E
R 21 E
R 22 E
R 23 E
R 24 E
T 23 N
T 22 N
T 21 N
T 18 N
105°20'
105°10'
105°00'
104°50'
104°40'
104°30'

LEGEND

1 — COLMOR-SWASTIKA-MION: Shallow and deep, nearly level to very steep, well drained soils; on upland side slopes, hills, and ridges

2 — PARTRI-CARNERO-CREWS: Shallow to deep, nearly level to gently sloping, well drained soils; on upland side slopes, on low hills, and along ridges

3 — ROCK OUTCROP-SOMBORDORO-BERNAL: Rock outcrop, and shallow, moderately sloping to very steep, well drained soils; on upland benches, ridges, and sides of shallow to deep canyons and escarpments

4 — ROCK OUTCROP-HAPLUSTOLLS-ARGIUSTOLLS: Rock outcrop, and shallow to deep, very steep to extremely steep, well drained soils; on benches, ridges, and escarpments, on side slopes in deeply cut sandstone canyons, and on the edges of basalt-capped mesas in basalt flows

5 — APACHE-ROCK OUTCROP-AYON: Shallow and deep, nearly level to moderately steep, well drained soils, and rock outcrop; on mesas, low vertical escarpments, and side slopes and along ridges in basalt flows

6 — CAPULIN-CHARETTE: Deep, nearly level to gently sloping, well drained soils; on side slopes in basalt flows

7 — DARGOL-ROCK OUTCROP-VAMER: Shallow to moderately deep, gently sloping to very steep, well drained soils, and rock outcrop; on mountainsides, mesas, ridges, benches, foothills, peaks, and side slopes

8 — MORENO-BRYCAN-HESPERUS: Deep, nearly level to moderately sloping, well drained soils; in alluvial mountain valleys and on lower part of alluvial mountainsides

9 — RATON-BARELA-YANKEE: Shallow to deep, nearly level to very steep, well drained soils; in valleys and on side slopes, ridges, benches, and mesas in basalt flows

10 — ETOE-ETOWN-MAES: Deep, undulating to extremely steep, well drained soils; on mountainsides and benches

Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

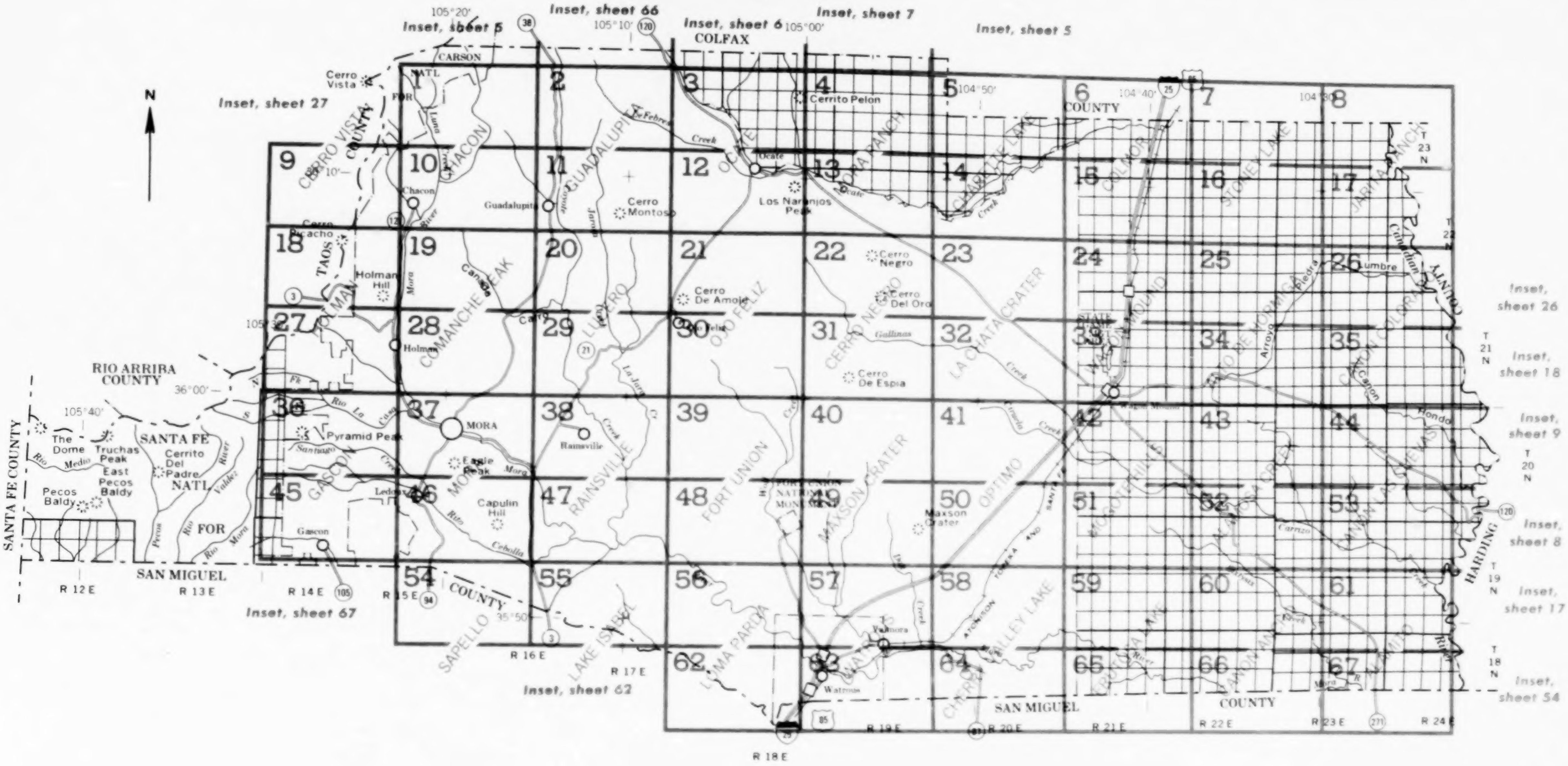
Compiled 1984

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
NEW MEXICO AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

MORA COUNTY AREA, NEW MEXICO

Scale 1:380,160
1 0 1 2 3 4 5 6 Miles
1 0 5 10 Km



Inset, sheet 5
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Inset, sheet 54
Inset, sheet 67
Inset, sheet 62
N
105°20'
105°10'
105°00'
104°50'
104°40'
104°30'
105°40'
36°00'
35°50'
COLFAX
COUNTY
CARSON
NATL
FOR
TAOS
COUNTY
RIO ARRIBA
COUNTY
SANTA FE COUNTY
SANTA FE
NATL
FOR
SAN MIGUEL
COUNTY
HARDING
Cerro Vista
Cerro Picacho
Holman Hill
Chacon
Guadalupita
Cerro Montoso
Ocate
Los Naranjos Peak
Cerrito Pelon
Cerro Negro
Cerro Del Oro
Cerro De Amole
Cerro De Espia
Holman
MORA
Rainsville
Pyramid Peak
Eagle Peak
Capulin Hill
Ledoux
Gascon
The Dome
Truchas Peak
East Pecos Baldy
Pecos Baldy
Cerrito Del Padre
Maxson Crater
Fort Union National Monument
Valmora
Watrous
Wagon Mound
Lumbre
R 12 E
R 13 E
R 14 E
R 15 E
R 16 E
R 17 E
R 18 E
R 19 E
R 20 E
R 21 E
R 22 E
R 23 E
R 24 E
T 23 N
T 22 N
T 21 N
T 20 N
T 19 N
T 18 N
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67
CERRO VISTA
CHACON
GUADALUPITA
OCATE
OJOYA RANCH
CHARETTE LAKE
COLMOR
STONEY LAKE
JARITA RANCH
HOLMAN
COMANCHE PEAK
LUCERO
OJO FELIZ
CERRO NEGRO
LA CHATA CRATER
WAGON MOUND
OJO DE HORMIGA
CANON COLORADO
GASCON
MORA
RAINSVILLE
FORT UNION
MAXSON CRATER
OPTIMO
MOSQUITERO
LA MORA CREEK
SAPELLO
LAKE ISABEL
LOMA PARDA
WATROUS
CHERRY VALLEY LAKE
LAGUNA LAKE
CANON AGUA

INDEX TO MAP SHEETS

MORA COUNTY AREA, NEW MEXICO

Scale 1:380,160

1 0 1 2 3 4 5 6 Miles

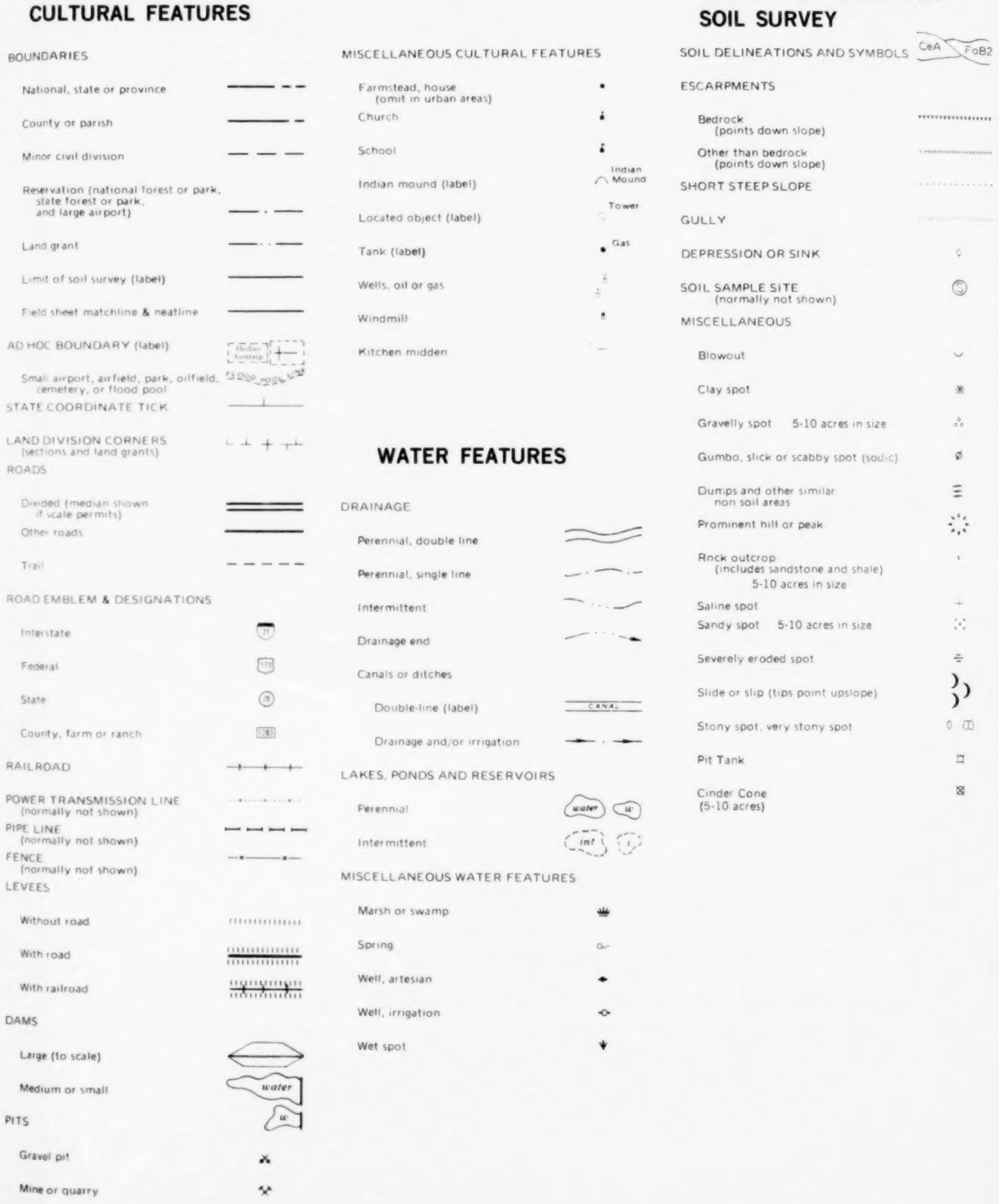
1 0 5 10 Km

SOIL LEGEND

The publication symbol does not designate slopes. The first letter, a capital, is the initial letter of the mapping unit name. The second letter is a capital if the mapping unit is broadly defined; otherwise, it is a lower case letter.

SYMBOL	NAME	SYMBOL	NAME
AA	Apache-Ayon complex, gently sloping	MA	Maes-Etoe complex, hilly
AB	Apache-Rock outcrop complex, moderately sloping	MB	Maes-Etoe complex, extremely steep
AC	Apache-Rock outcrop-Ayon complex, moderately steep	Mc	Manzano loam, 1 to 3 percent slopes
AR	Argiustolls-Rock outcrop complex, extremely steep	MD	Mion-Litle-Rock outcrop complex, very steep
		ME	Mion-Litle-Rock outcrop association, very steep
BA	Barela-Yankee association, gently sloping	MF	Mion-Penrose Variant-Rock outcrop complex, very steep
BC	Bernal-Rock outcrop-Carnero complex, moderately sloping	MG	Mion-Penrose Variant-Rock outcrop association, very steep
Bd	Breece Variant sandy loam, 3 to 8 percent slopes	Mh	Moreno loam, 3 to 8 percent slopes
Be	Brycan loam, 1 to 3 percent slopes	Mo	Moreno loam, 8 to 15 percent slopes
Bf	Brycan loam, 3 to 8 percent slopes	MR	Moreno Brycan association, sloping
BH	Burnac-Hillery association, hilly		
		NR	Nambe Variant-Rock outcrop-Rubble land complex, extremely steep
CA	Capulin-Charette-Ayon association, gently sloping		
Cb	Ceboya silty clay loam, 0 to 1 percent slopes	Pa	Partri loam, 1 to 3 percent slopes
CC	Charette-Capulin association, gently undulating	PB	Partri loam, gently sloping
CD	Colmor loam, undulating	PC	Partri-Carnero-Bernal association, undulating
Ce	Colmor silt loam, 1 to 3 percent slopes	PM	Penrose-Mion-Litle association, moderately sloping
CF	Crews-Tricon association, undulating	PT	Pidineen-Tricon complex, undulating
CN	Cundiyo-Nambe Variant association, extremely steep		
		RB	Raton-Barela association, hilly
DA	Dalcan-Raton complex, undulating	RD	Raton-Dalcan association, hilly
DF	Dargol-Fuera association, hilly	RE	Raton-Rock outcrop complex, very steep
DR	Dargol-Rocio-Vamer association, hilly	Rf	Remunda loam, 1 to 3 percent slopes
DV	Dargol-Rocio-Vamer association, very steep	Rh	Remunda clay loam, 0 to 2 percent slopes
		RL	Remunda-Lavate Variant association, gently sloping
EE	Etoe-Etown association, very steep	RO	Rock outcrop-Bernal complex, moderately steep
ER	Etoe-Rock outcrop-Rubble land complex, extremely steep		
EV	Eutroboralfs-Rock outcrop-Vamer complex, extremely steep	SA	Sombordoro-Rock outcrop-Tuloso complex, moderately sloping
		SB	Somdordoro-Rock outcrop-Tuloso complex, very steep
FH	Firo-Hesperus association, hilly	SM	Spud-Burnac association, very steep
FR	Firo-Rock outcrop complex, extremely steep	SW	Swastika silt loam, gently sloping
FU	Fuera-Dargol association, very steep	Sx	Swastika silty clay loam, 0 to 3 percent slopes
HA	Haplustolls-Rock outcrop complex, extremely steep	TA	Tinaja gravelly loam, moderately steep
Hb	Hesperus sandy loam, 1 to 3 percent slopes	TT	Torreon-Thunderbird association, gently sloping
Hc	Hesperus sandy loam, 3 to 8 percent slopes		
Ho	Holman complex, 3 to 5 percent slopes	US	Ustifluvents, frequently flooded
Ka	Kinesava sandy loam, 3 to 8 percent slopes	VA	Vamer-Rock outcrop-Eutroboralfs complex, hilly
Kb	Kinesava loam, 1 to 3 percent slopes	Ve	Vermejo silty clay loam, 0 to 3 percent slopes
KR	Krakon-Rock outcrop complex, hilly	VK	Vermejo-Karde association, gently sloping
La	La Brier silty clay loam, 0 to 3 percent slopes	YS	Yankee-Saladon association, gently sloping
LM	Litle-Mion association, moderately sloping		

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND



CULTURAL FEATURES

BOUNDARIES

National, state or province

County or parish

Minor civil division

Reservation (national forest or park, state forest or park, and large airport)

Land grant

Limit of soil survey (label)

Field sheet matchline & neatline

AD HOC BOUNDARY (label)

Small airport, airfield, park, oilfield, cemetery, or flood pool

STATE COORDINATE TICK

LAND DIVISION CORNERS (sections and land grants)

ROADS

Divided (median shown if scale permits)

Other roads

Trail

ROAD EMBLEM & DESIGNATIONS

Interstate

Federal

State

County, farm or ranch

RAILROAD

POWER TRANSMISSION LINE (normally not shown)

PIPE LINE (normally not shown)

FENCE (normally not shown)

LEVEES

Without road

With road

With railroad

DAMS

Large (to scale)

Medium or small

PITS

Gravel pit

Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

Farmstead, house (omit in urban areas)

Church

School

Indian mound (label)

Located object (label)

Tank (label)

Wells, oil or gas

Windmill

Kitchen midden

WATER FEATURES

DRAINAGE

Perennial, double line

Perennial, single line

Intermittent

Drainage end

Canals or ditches

Double-line (label)

Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

Perennial

Intermittent

MISCELLANEOUS WATER FEATURES

Marsh or swamp

Spring

Well, artesian

Well, irrigation

Wet spot

SPECIAL SYMBOLS FOR SOIL SURVEY

SOIL DELINEATIONS AND SYMBOLS

ESCARPMENTS

Bedrock (points down slope)

Other than bedrock (points down slope)

SHORT STEEP SLOPE

GULLY

DEPRESSION OR SINK

SOIL SAMPLE SITE (normally not shown)

MISCELLANEOUS

Blowout

Clay spot

Gravelly spot 5-10 acres in size

Gumbo, slick or scabby spot (sodic)

Dumps and other similar non soil areas

Prominent hill or peak

Rock outcrop (includes sandstone and shale) 5-10 acres in size

Saline spot

Sandy spot 5-10 acres in size

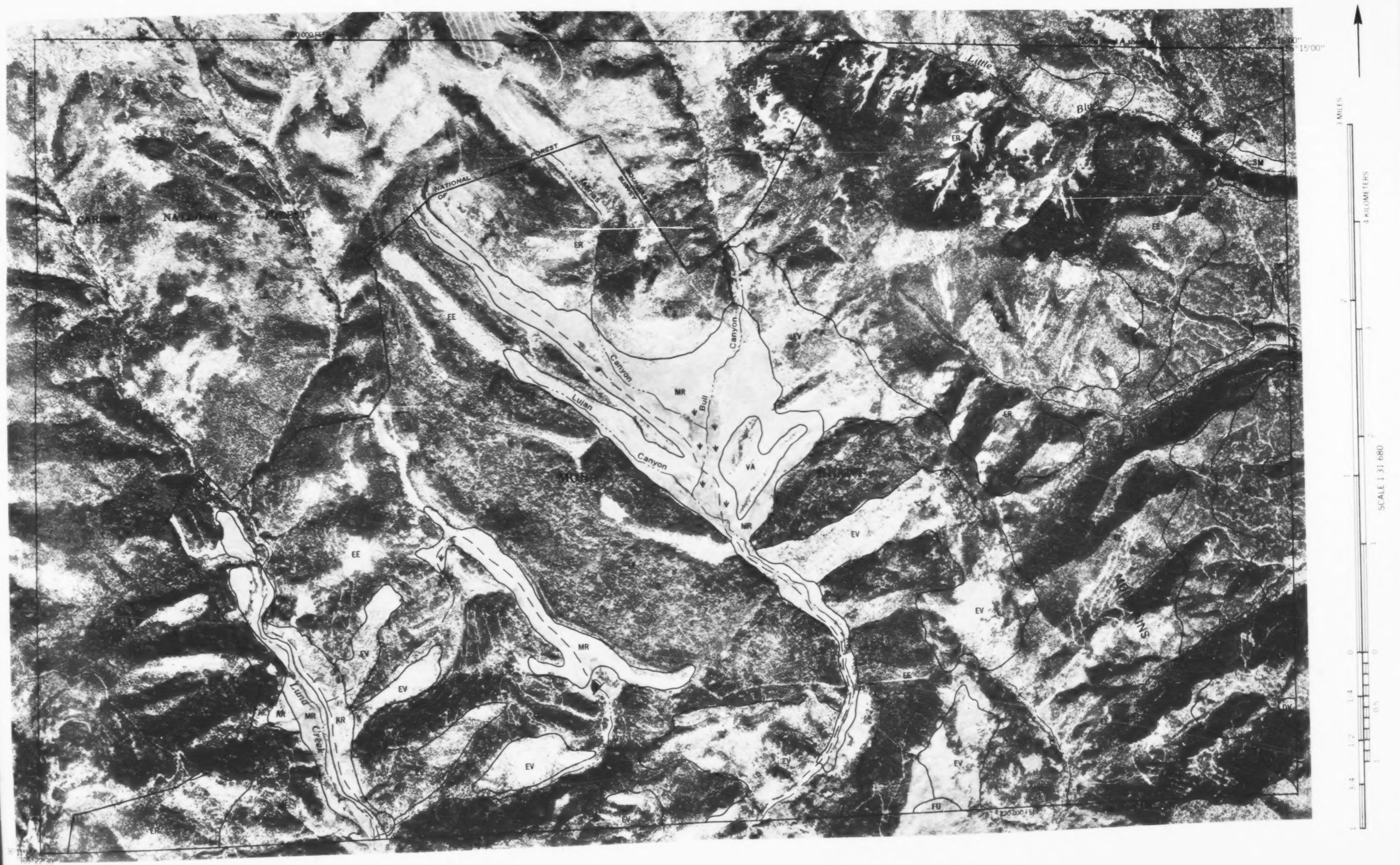
Severely eroded spot

Slide or slip (tips point upslope)

Stony spot, very stony spot

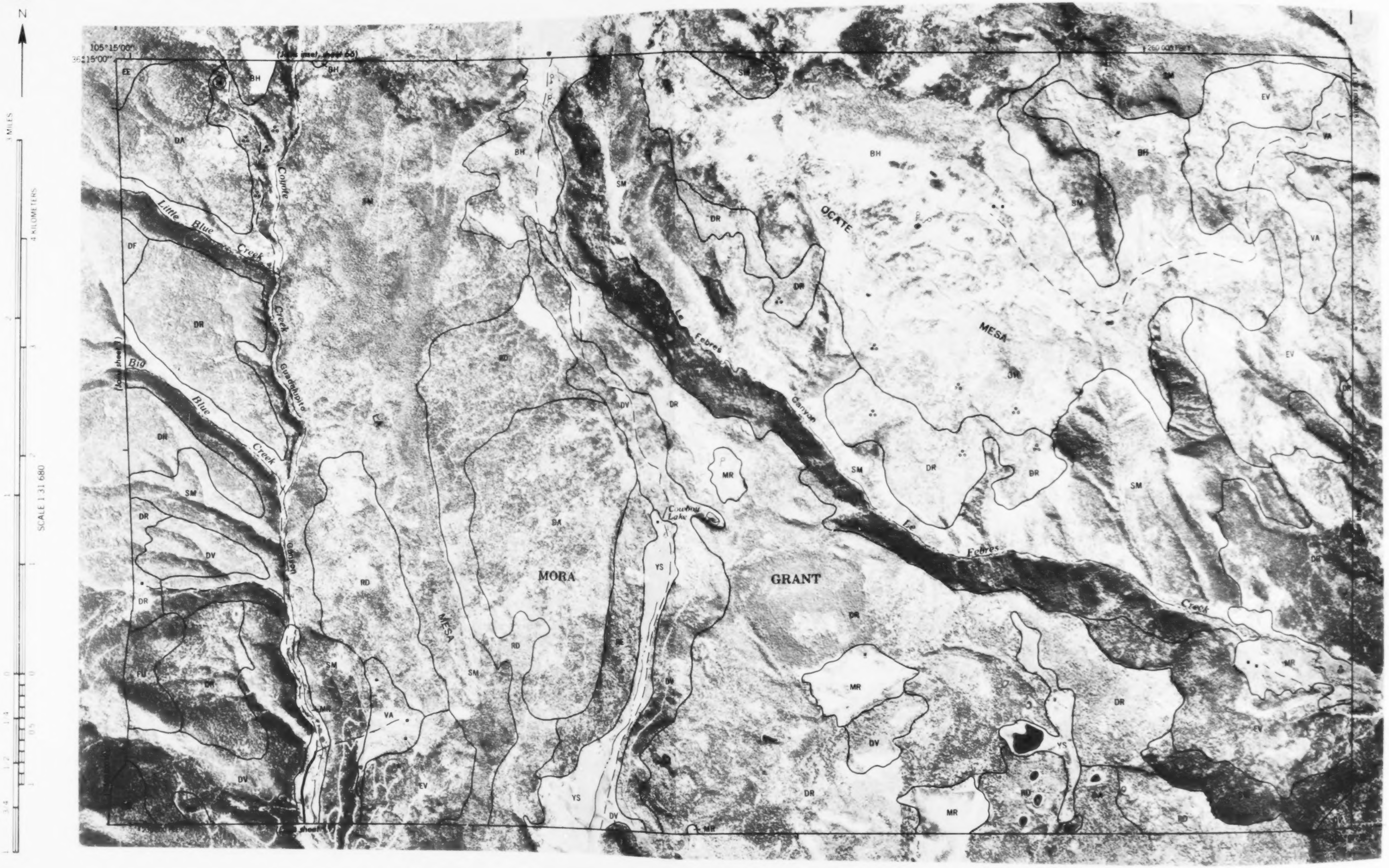
Pit Tank

Cinder Cone (5-10 acres)


N
15'00"
CARSON NATIONAL FOREST
NATIONAL FOREST
OF
ER
EE
EV
MR
VA
KR
FU
SM
Lujan Canyon
Bull Canyon
Canyon
Luna Creek
Little Blue
MORA
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
3
0.5

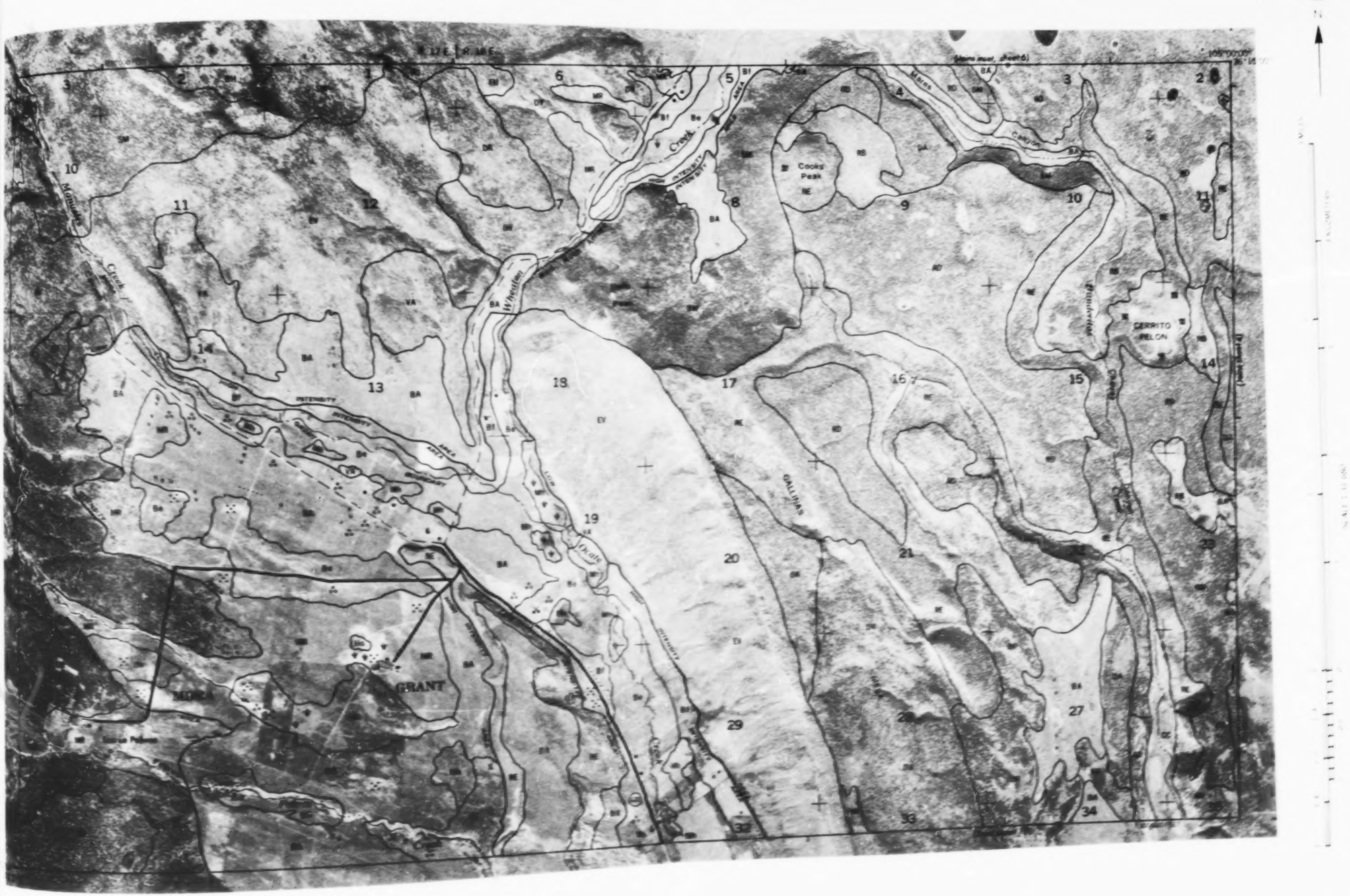
②

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 2

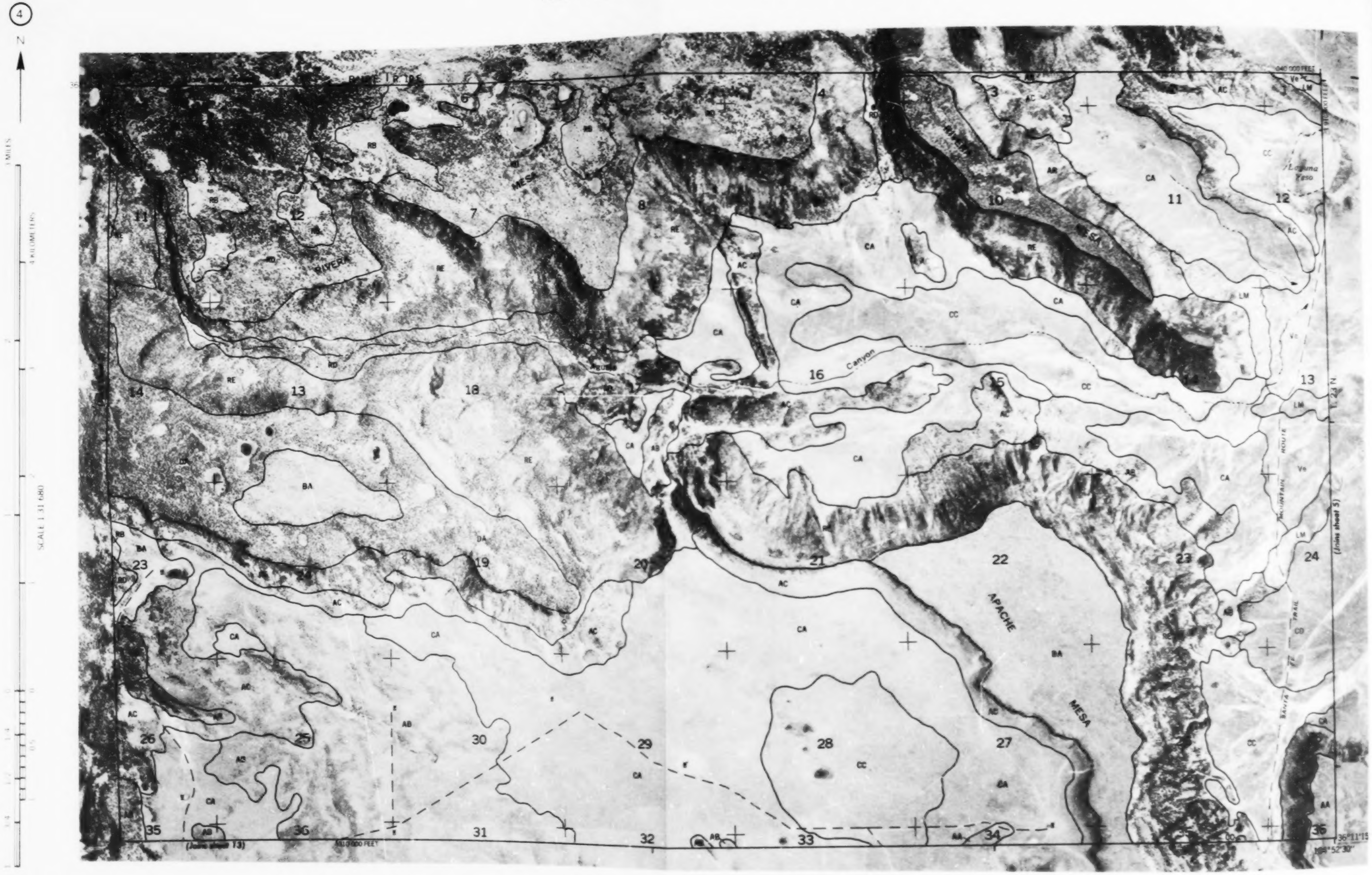

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°15'00"
36°15'00"
(Joins sheet 1)
(Joins sheet)
260 000 FEET
Little Blue Creek
Big Blue Creek
Coyote Creek
Guadalupita Creek
Tomason
Le Febres Canyon
Le Febres Creek
Cowboy Lake
OCATE MESA
MORA MESA
MORA GRANT
BH
DA
DF
DR
SM
DV
FU
MR
VA
EV
RD
BR
YS
EE

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating

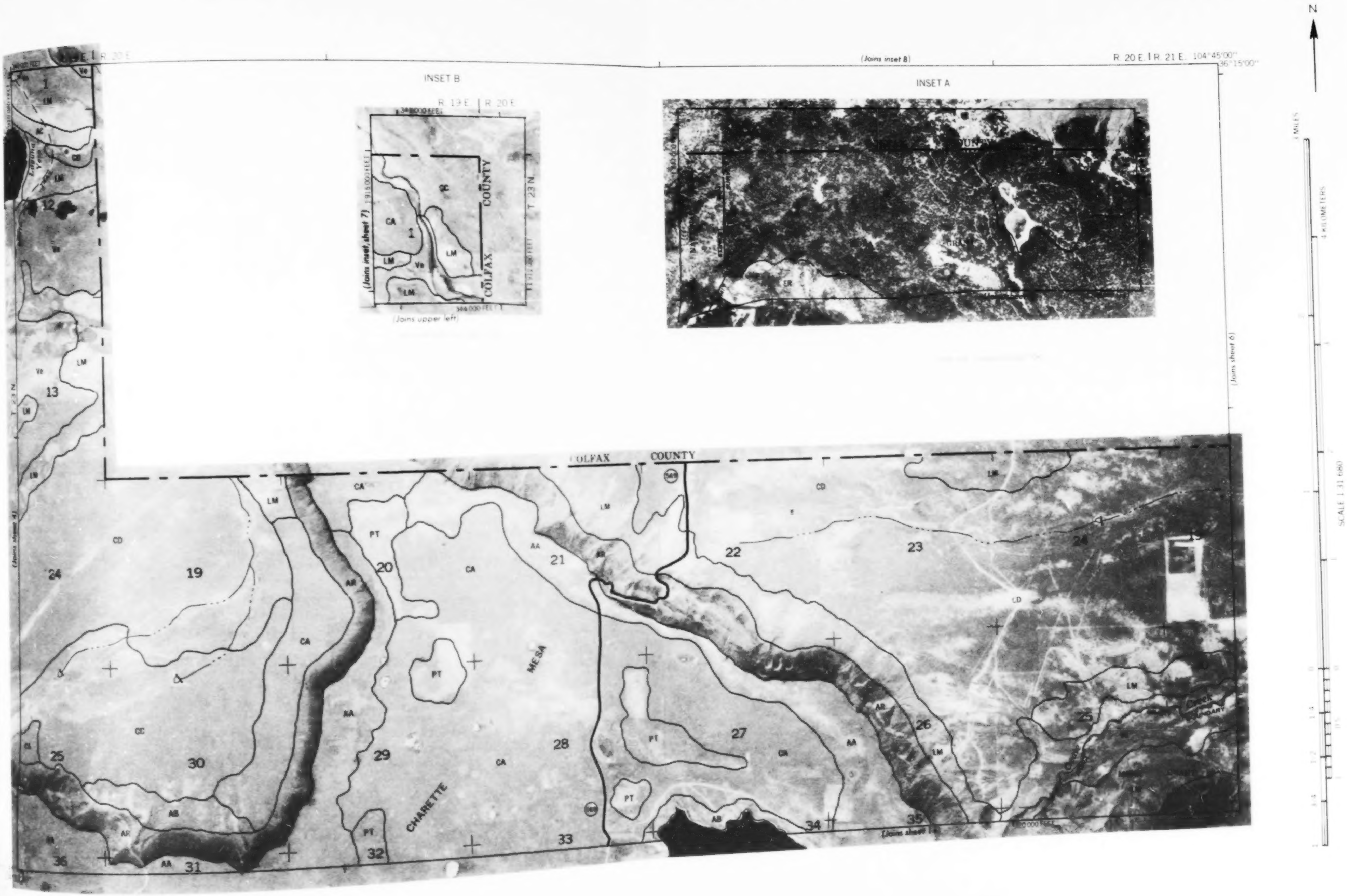
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 3


N
R 17 E
R 18 E
Cooks Peak
CERRITO PELON
Wheaton
Creek
Creek
Canyon
Mares
Ocate
GALLINAS
MORA
GRANT
INTENSITY
AREA
BA
BE
RE
EV
MR
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
27
28
29
32
33
34
35

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 4


④
N
3 MILES
4 KILOMETERS
SCALE 1:31 680
RIVERA
MESA
Canyon
APACHE
MESA
Laguna Yeso
MOUNTAIN ROUTE
SANTA FE TRAIL
(Joins sheet 5)
(Joins sheet 13)
040 000 FEET
910 000 FEET
36°11'15"
104°52'30"
T. 24 N.
R. 19 E.
3
4
5
6
7
8
10
11
12
13
14
15
16
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
AA
AB
AC
AR
AS
BA
CA
CC
CD
DA
LM
RB
RD
RE
Ve

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating

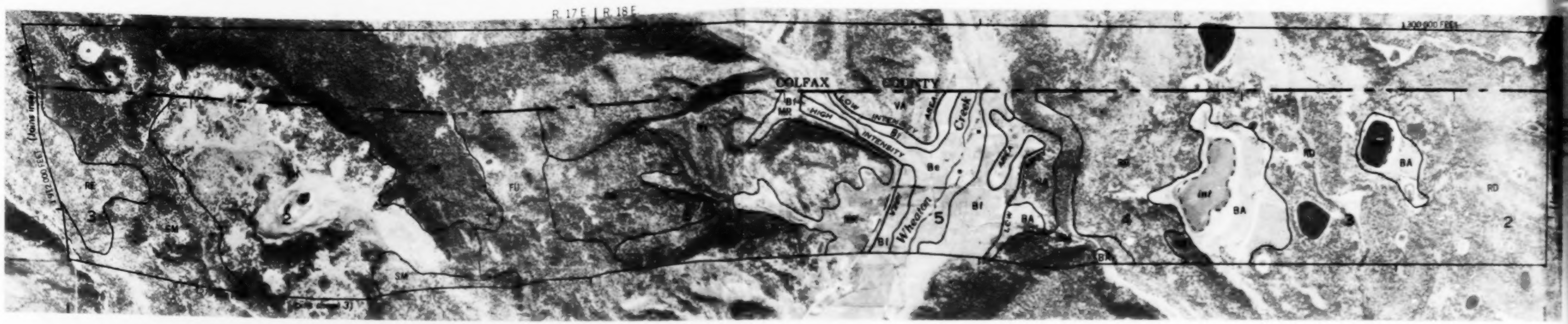

N
INSET B
R. 19 E. | R. 20 E.
COLFAX
COUNTY
T. 23 N.
(Joins inset, sheet 7)
(Joins upper left)
INSET A
(Joins inset B)
R. 20 E. | R. 21 E. 104°45'00"
36°15'00"
(Joins sheet 6)
(Joins sheet 4)
(Joins sheet 11)
COLFAX COUNTY
T. 23 N.
R. 20 E.
Laguna Yeso
MESA
CHARETTE
BOUNDARY
1
12
13
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
LM
AC
CD
Ve
CA
CC
PT
AA
AR
AB
ER
4 MILES
4 KILOMETERS
SCALE 1:31 680

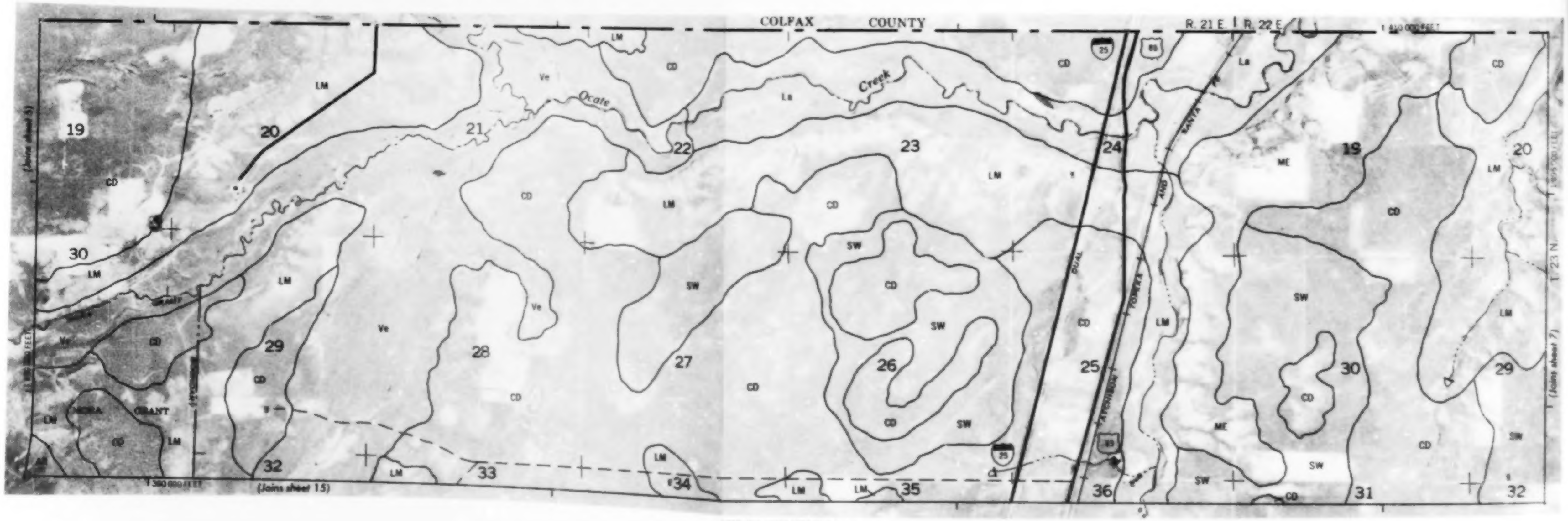
⑥

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 6

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
0

INSET A

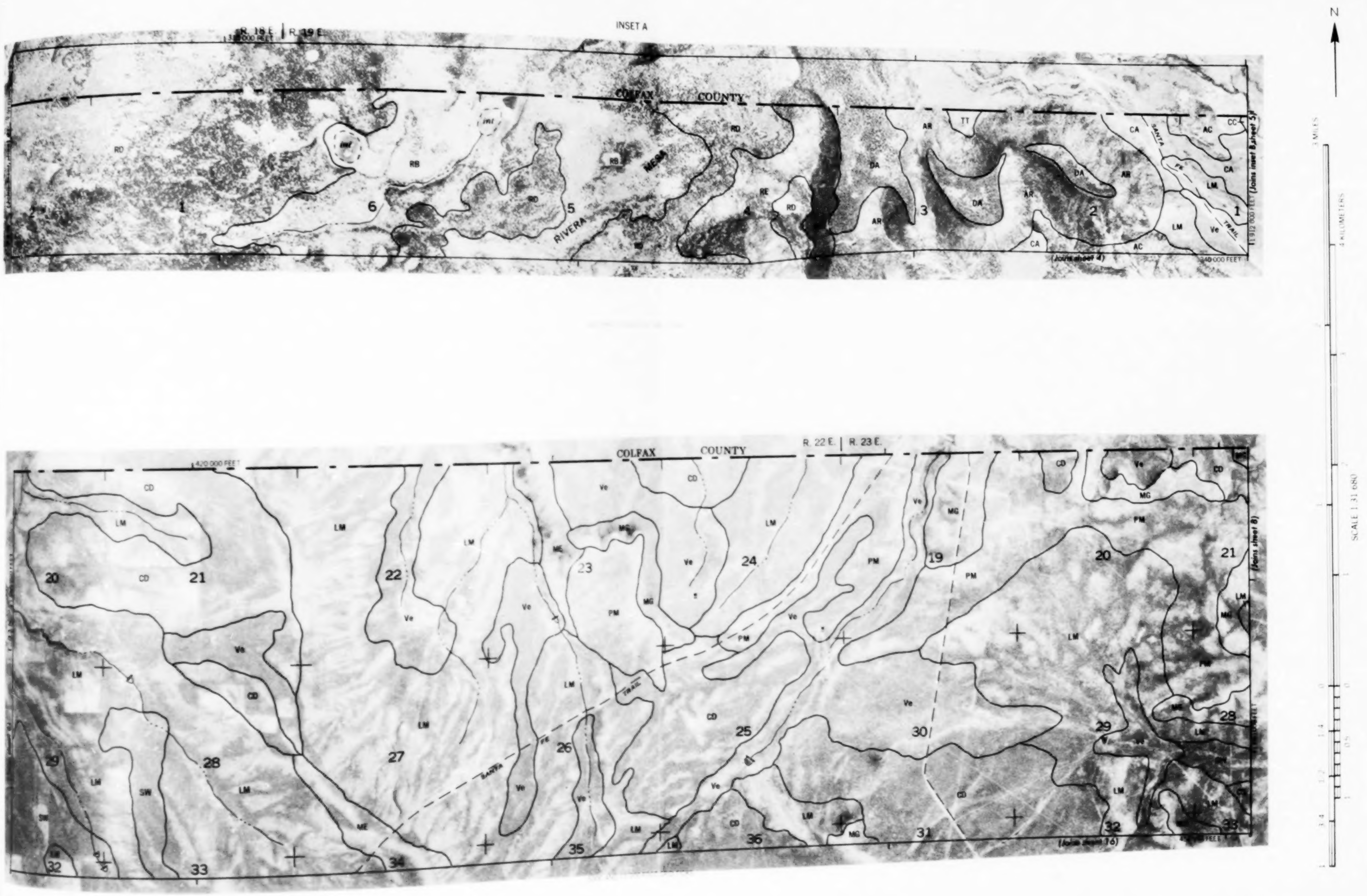

R. 17 E. | R. 18 E.
COLFAX COUNTY
(Joins inset)
(Joins sheet 3)
Wheaton Creek
HIGH INTENSITY AREA
LOW INTENSITY AREA
BF
MR
VA
Be
Bf
BA
RD
RE
SM
FU
Inf
3
2
5
4
3
2
1 300 000 FEET


COLFAX COUNTY
R. 21 E. | R. 22 E.
Ocate Creek
(Joins sheet 5)
(Joins sheet 7)
(Joins sheet 15)
MORA GRANT
DUAL
ATCHISON TOPEKA AND SANTA FE
25
85
T. 23 N.
19
20
21
22
23
24
19
20
30
29
28
27
26
25
30
29
32
33
34
35
36
31
32
LM
CD
Ve
La
ME
SW
1 360 000 FEET
1 510 000 FEET

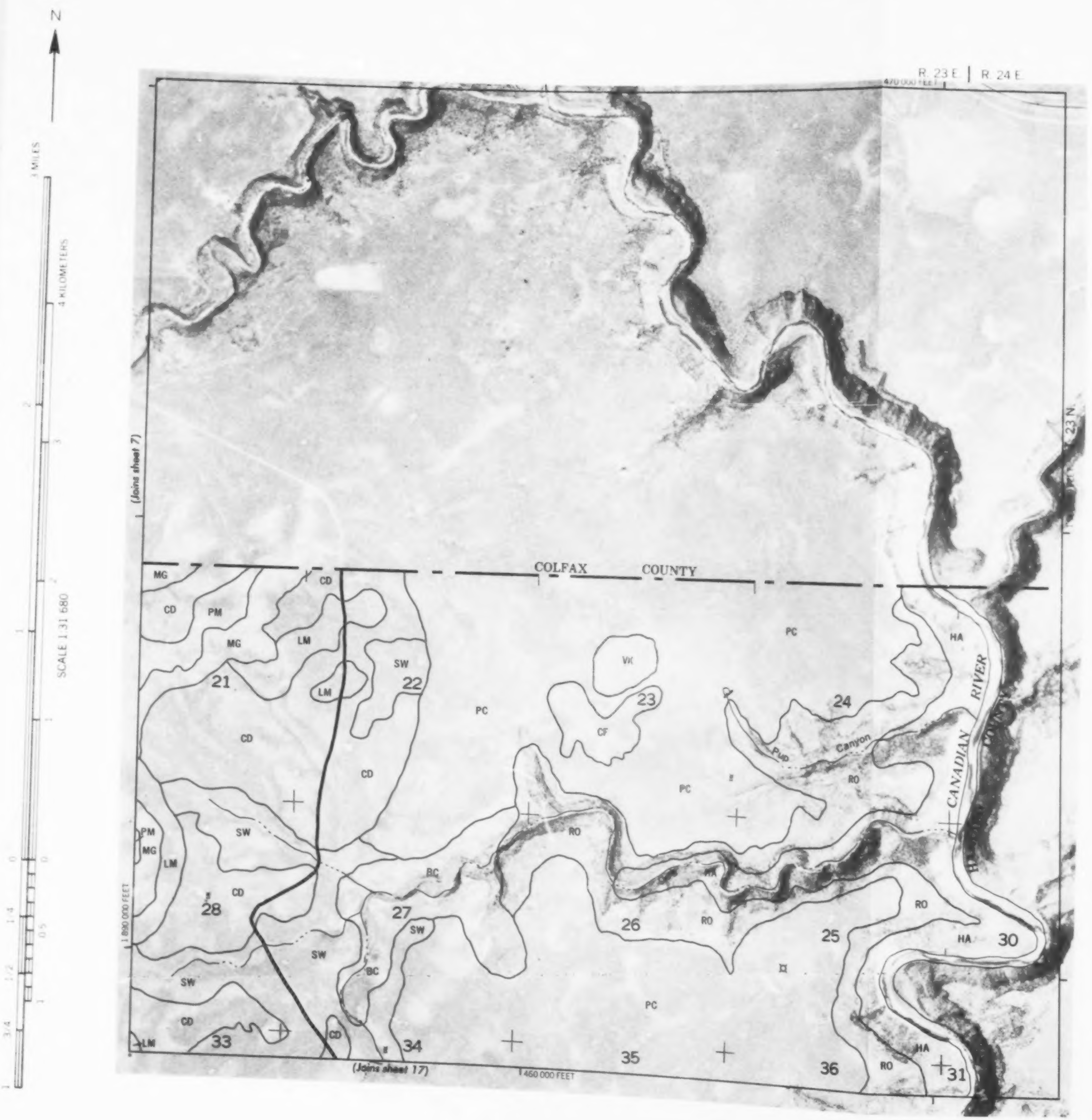
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 7

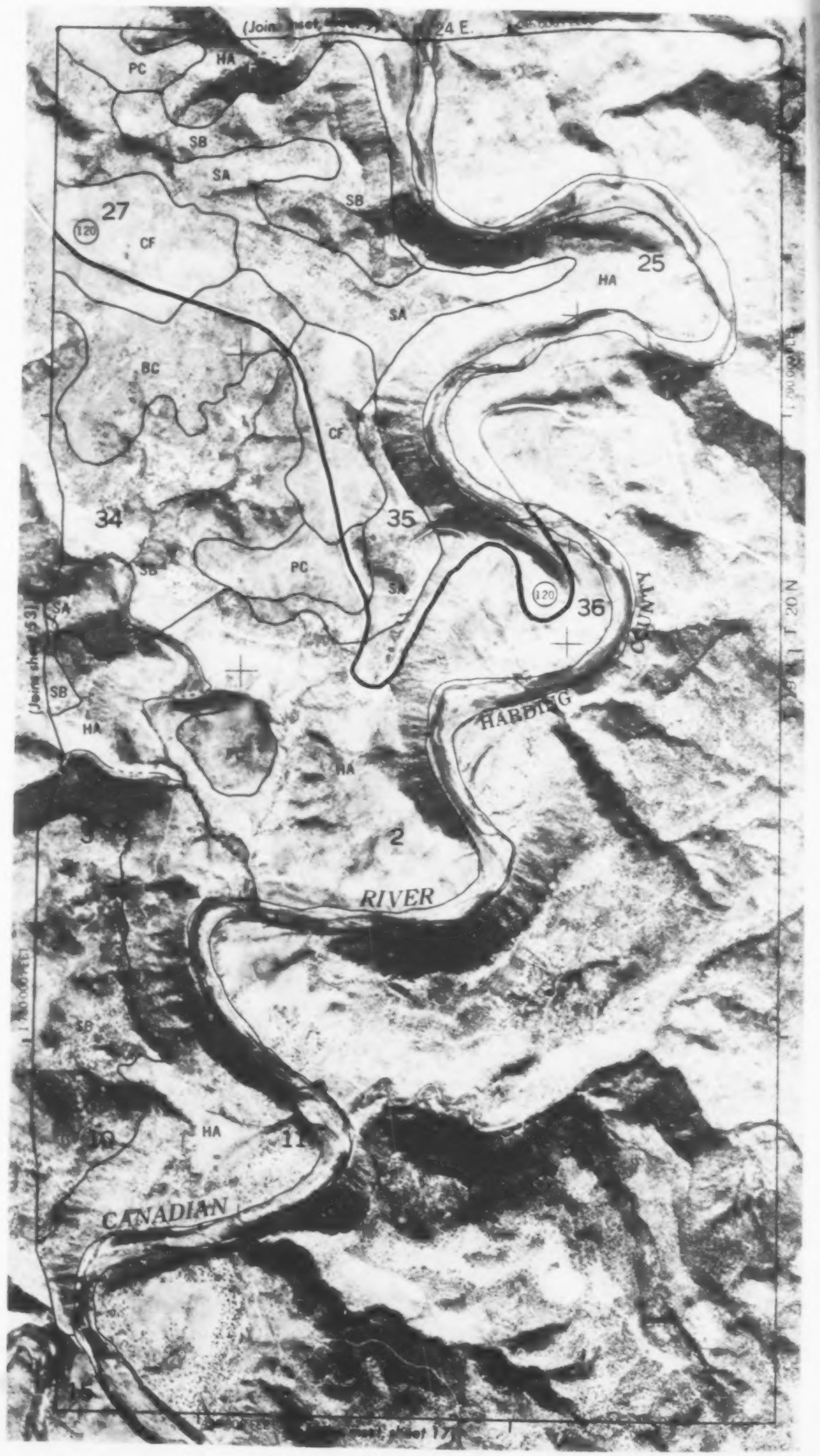
⑦


INSET A
R. 18 E. | R. 19 E.
COLFAX COUNTY
MESA
RIVERA
SANTA FE TRAIL
(Joins sheet 4)
(Joins inset B, sheet 5)
240 000 FEET
420 000 FEET
R. 22 E. | R. 23 E.
(Joins sheet 8)
(Joins sheet 16)
N
3 MILES
4 KILOMETERS
SCALE 1:31 680

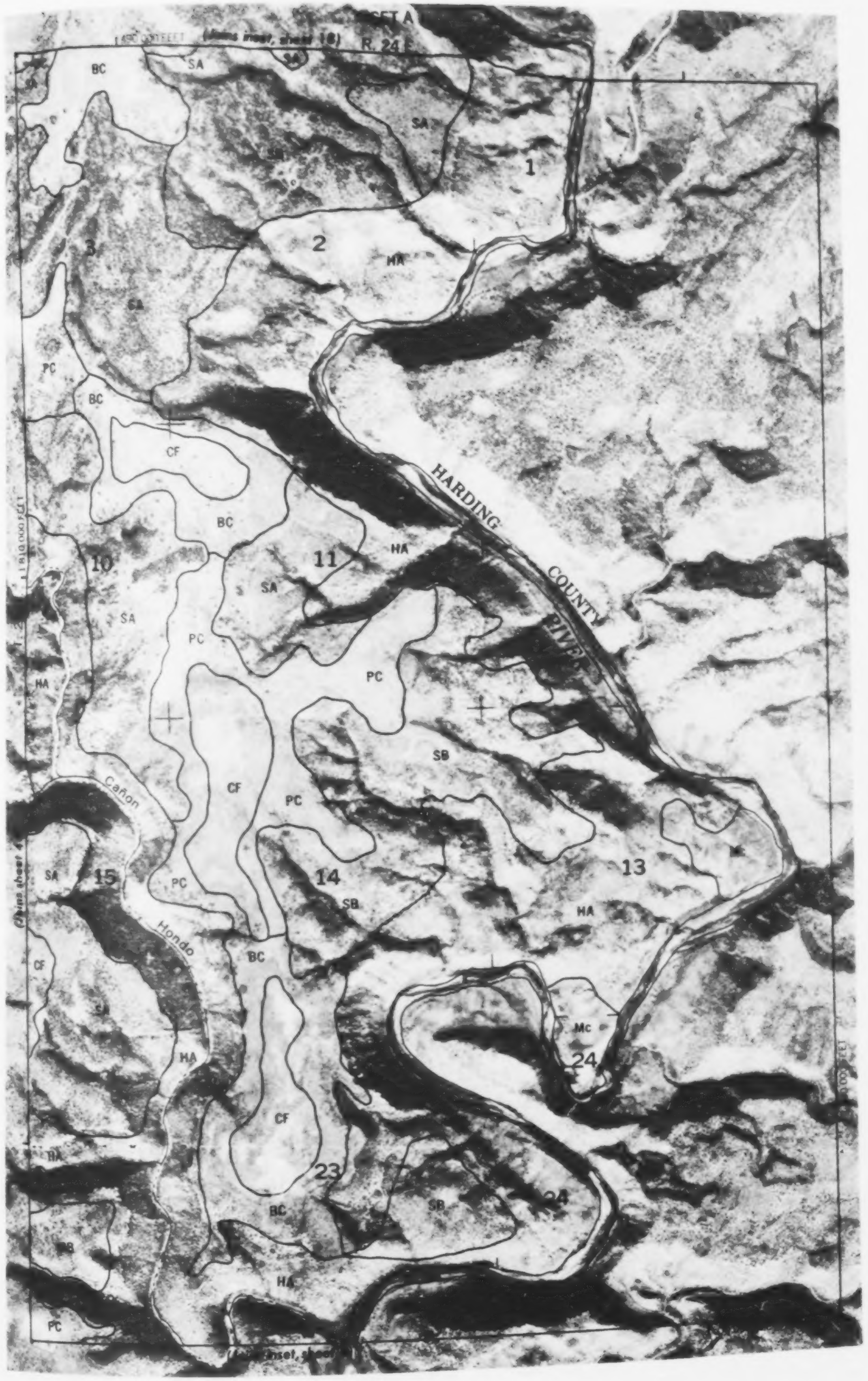
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 8

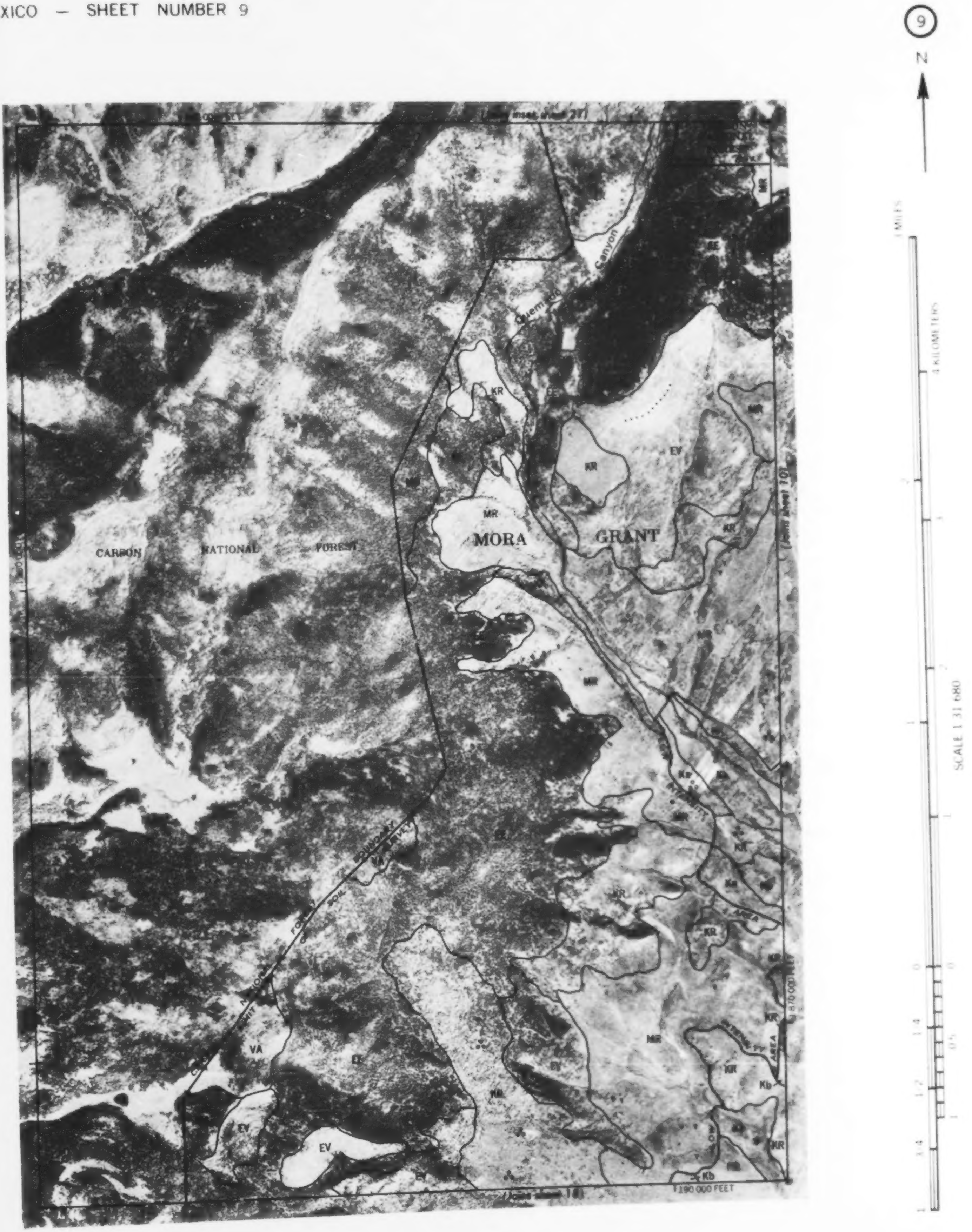

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
2
3
1
0
1/4
1/2
3/4
0.5
R. 23 E.
R. 24 E.
470 000 FEET
(Joins sheet 7)
(Joins sheet 17)
460 000 FEET
1 890 000 FEET
T. 23 N.
COLFAX
COUNTY
CANADIAN
RIVER
Pup
Canyon
MG
CD
PM
LM
SW
PC
VK
CF
HA
RO
BC
21
22
23
24
25
26
27
28
30
31
33
34
35
36

INSET A


(Joins sheet 7)
R. 24 E.
(Joins sheet 17)
(Joins sheet 13)
T. 20 N.
120
HARDING
COUNTY
RIVER
CANADIAN
PC
HA
SB
SA
CF
BC
27
25
34
35
36
2
10
11
15

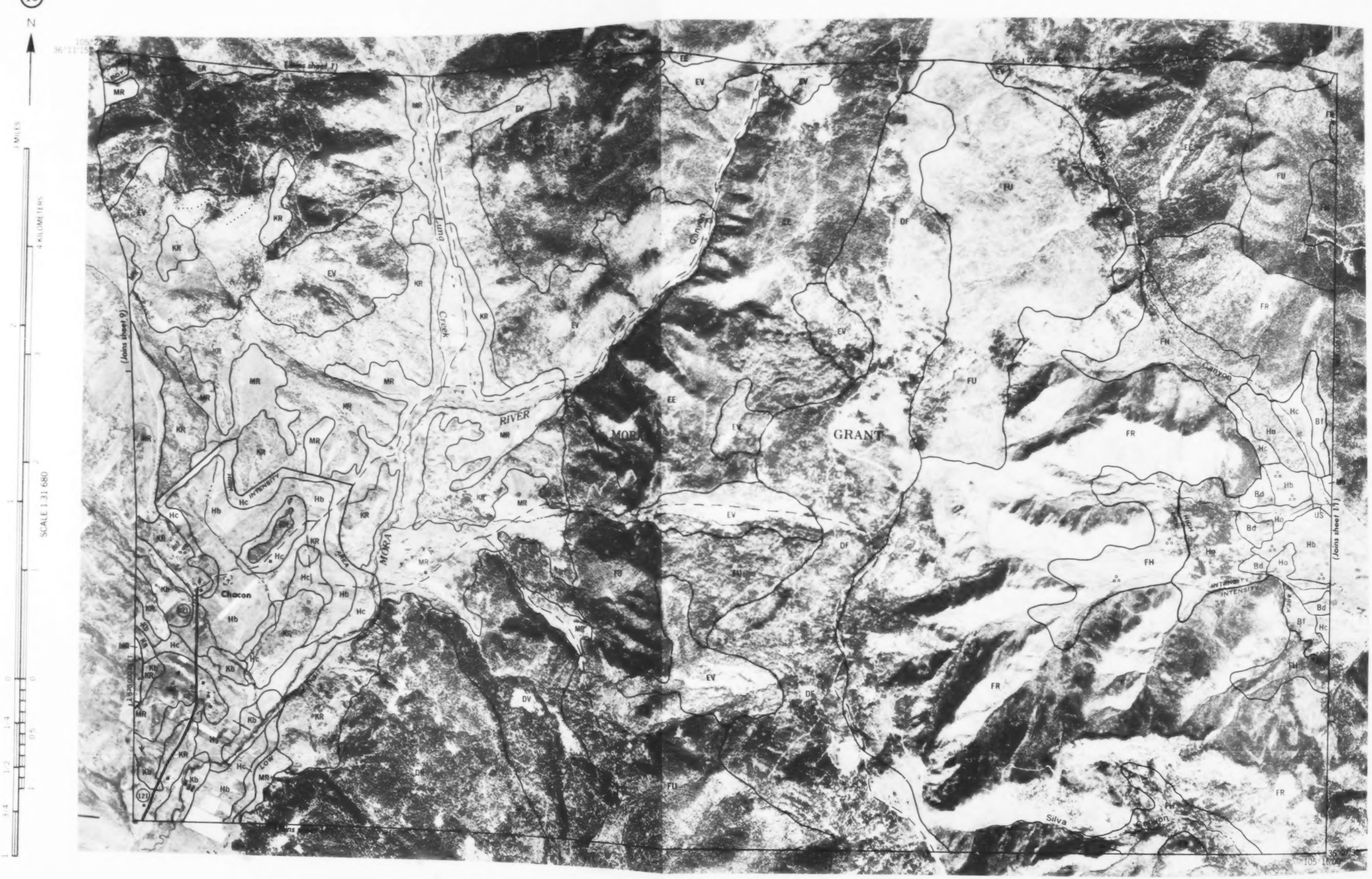
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating
[illegible]

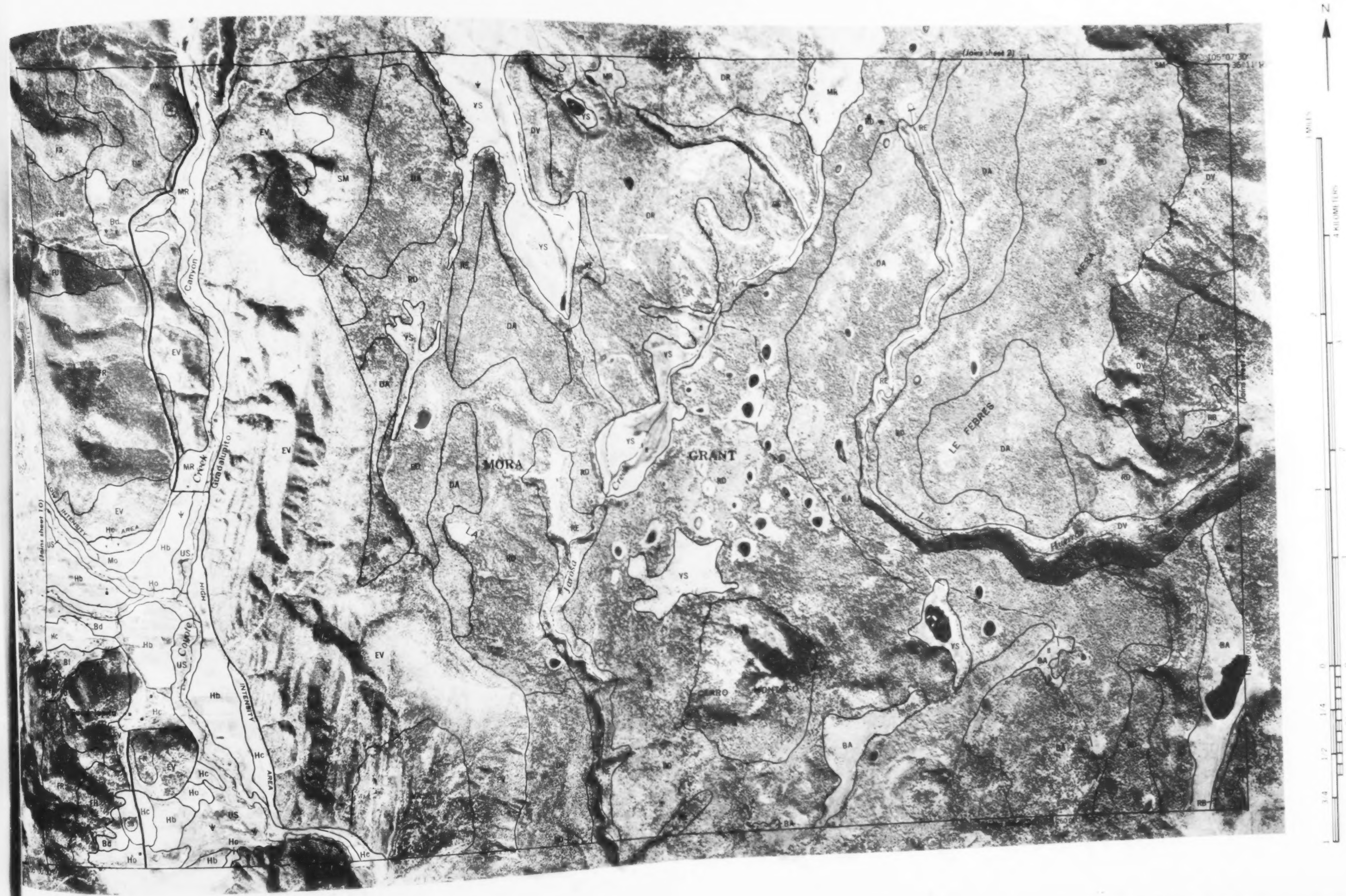

R. 24 E.
HARDING
COUNTY
RIVER
Cañon
Hondo
BC
SA
HA
CF
PC
SB
Mc
1
2
3
10
11
13
14
15
23
24


9
N
CARSON
NATIONAL
FOREST
MORA
GRANT
Canyon
MR
KR
EV
VA
Kb
190 000 FEET
MILES
KILOMETERS
SCALE 1:31 680

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 10

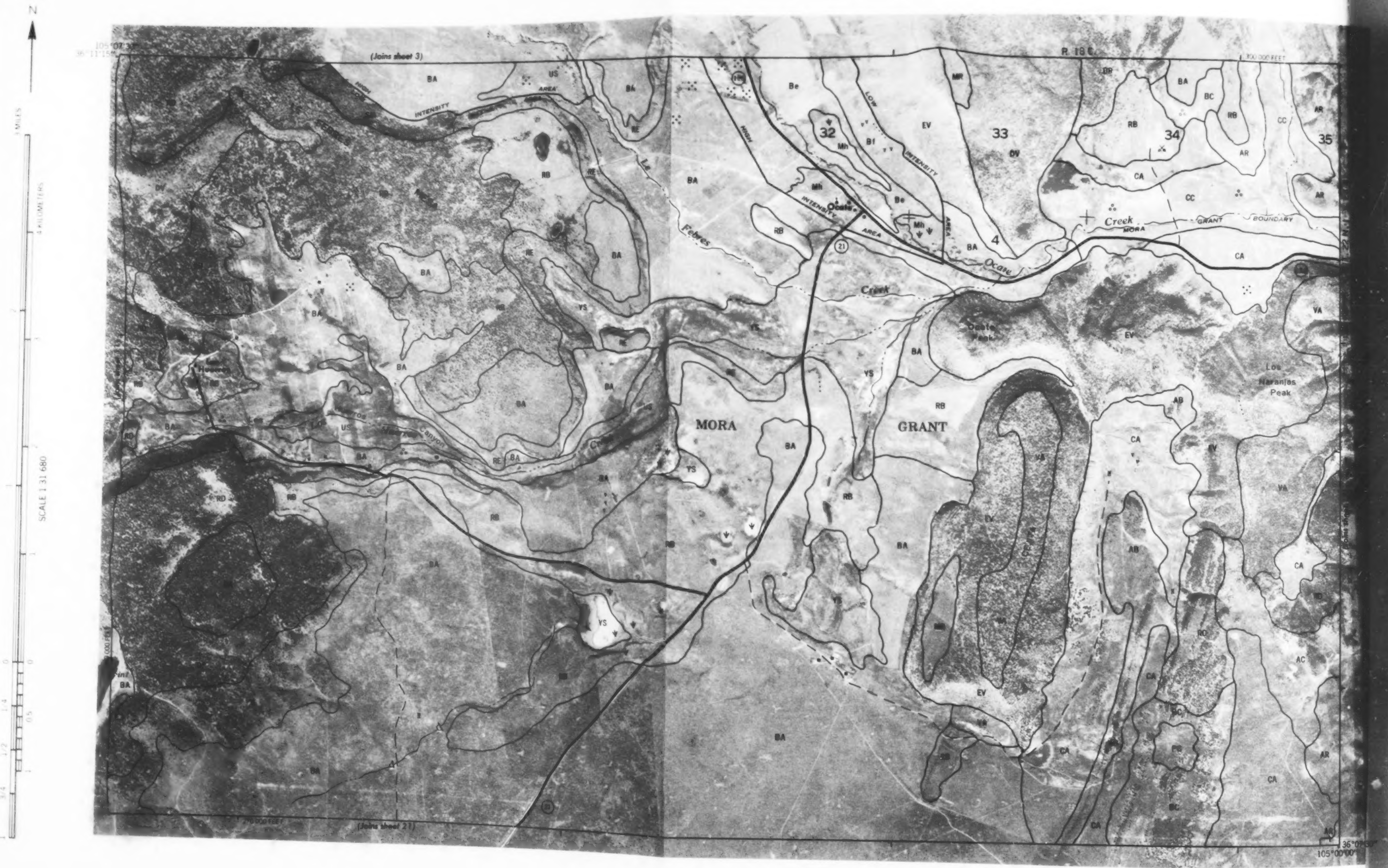
⑩

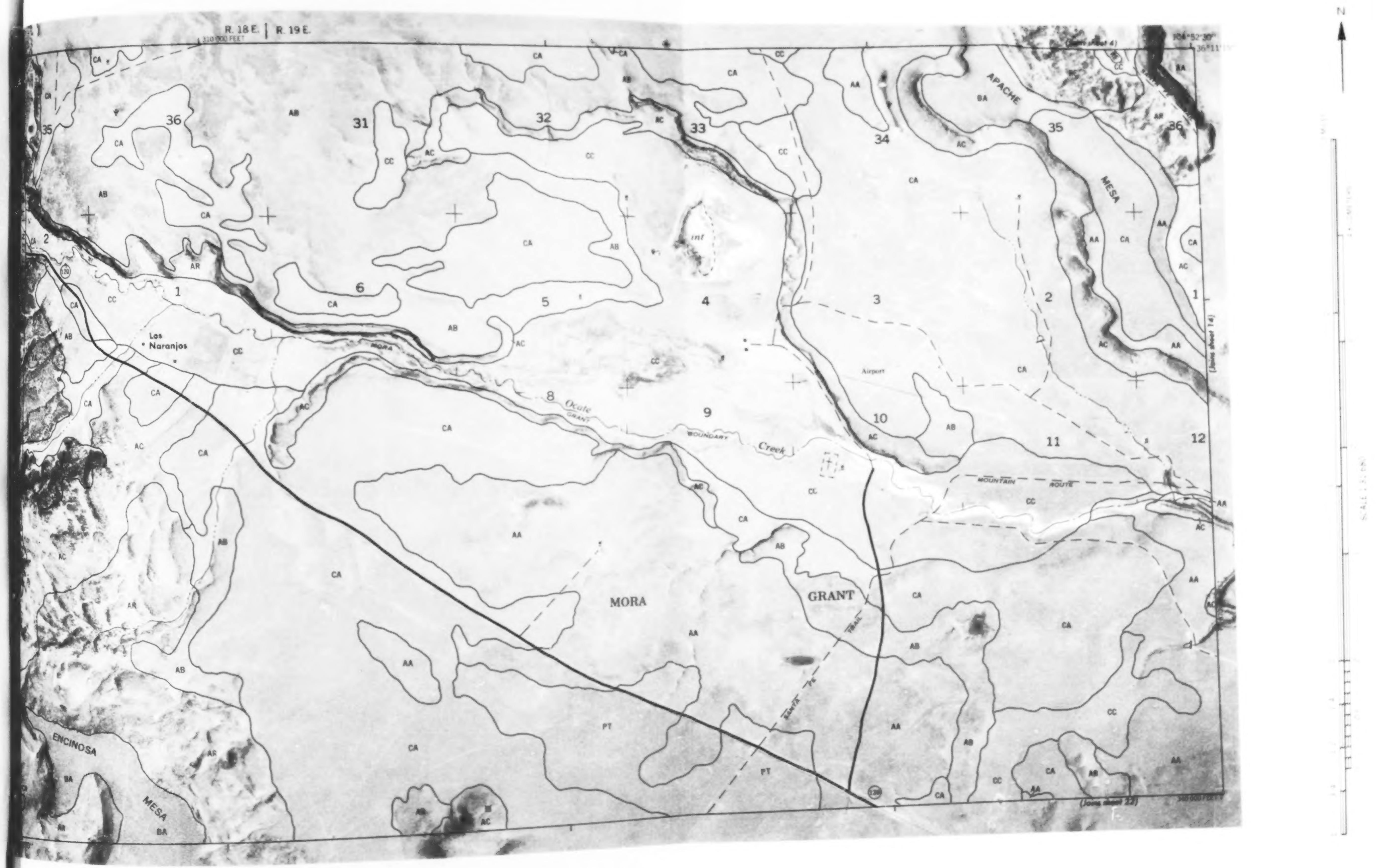

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°22'30"
36°11'15"
(Joins sheet 7)
(Joins sheet 9)
(Joins sheet 11)
MORA
GRANT
MORA RIVER
Luna Creek
Chacon
Canyon
Silva Canyon
High Intensity
Low Intensity
121
105°15'00"
36°07'30"
BDY
ER
MR
EV
KR
EE
DF
FU
FR
FH
Hc
Hb
Ha
Bd
Bf
US
Kb
DV
DK


N
(Joins sheet 3)
105°07'30"
(Joins sheet 10)
(Joins sheet 12)
Canyon
Creek
Guadalupito
Coyote
HIGH INTENSITY AREA
LOW INTENSITY AREA
MORA
GRANT
Jaroso
Creek
LE FEBRES
MESA
CERRO
MONTOSO
Huertas
MR
EV
SM
DA
RD
RE
YS
DV
DR
FR
Bd
Hc
Hb
Ho
Mo
US
LA
BA
RB
MILES
KILOMETERS
SCALE 1:31 680

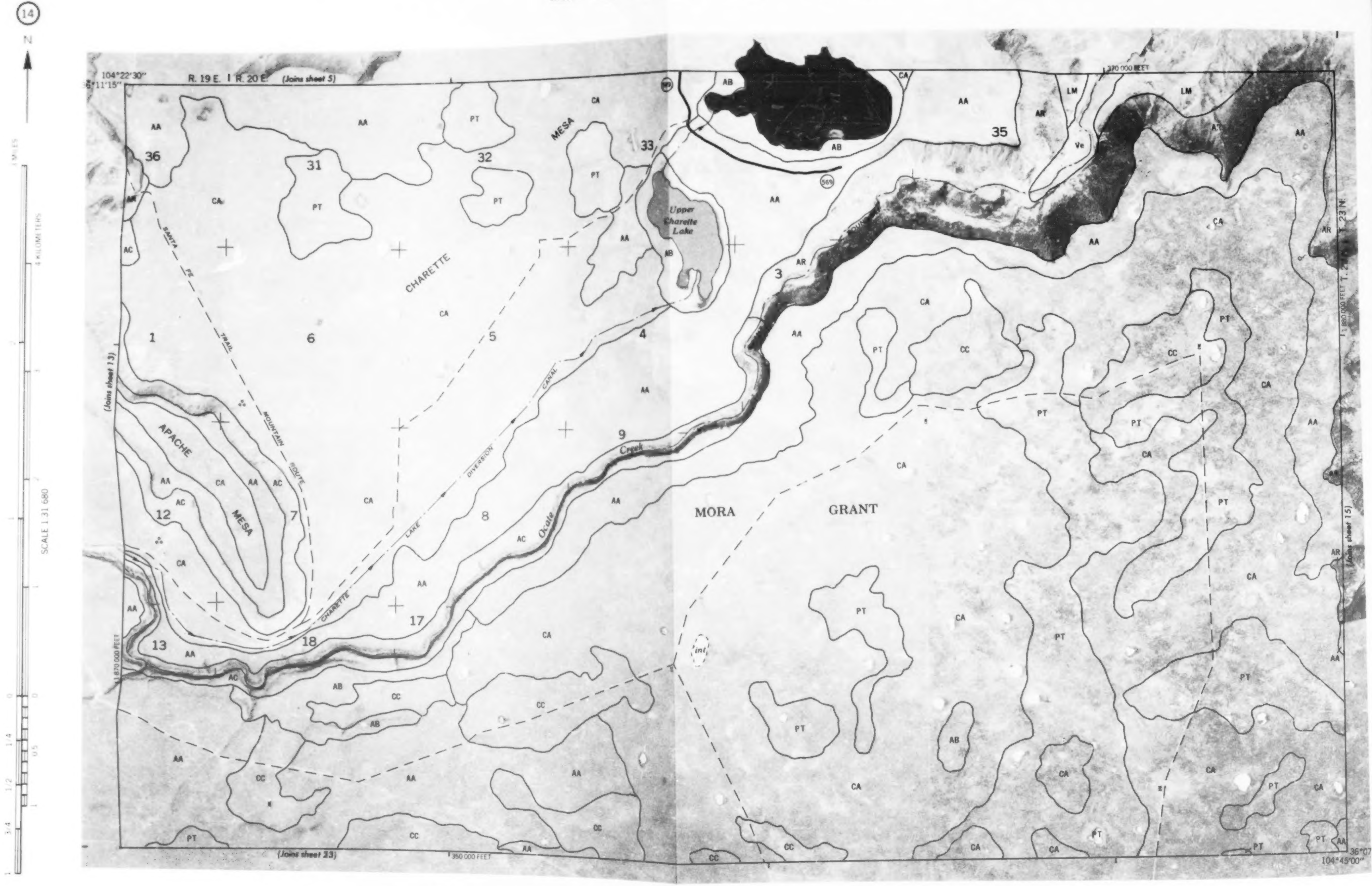
⑫

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 12


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
3
0.5
105°07'30"
36°11'15"
(Joins sheet 3)
(Joins sheet 21)
R 18 E
300 000 FEET
36°03'30"
105°00'00"
HIGH INTENSITY AREA
LOW INTENSITY AREA
32
33
34
35
4
21
MORA
GRANT
MORA GRANT BOUNDARY
Ocate
Ocate Creek
Ocate Peak
Los Naranjas Peak
Le Febres Creek
Creek
Canyon
BA
US
RB
RE
YS
DV
RD
Be
Bf
Mh
MR
EV
BC
CC
CA
AR
AB
VA
AC
PS
SC

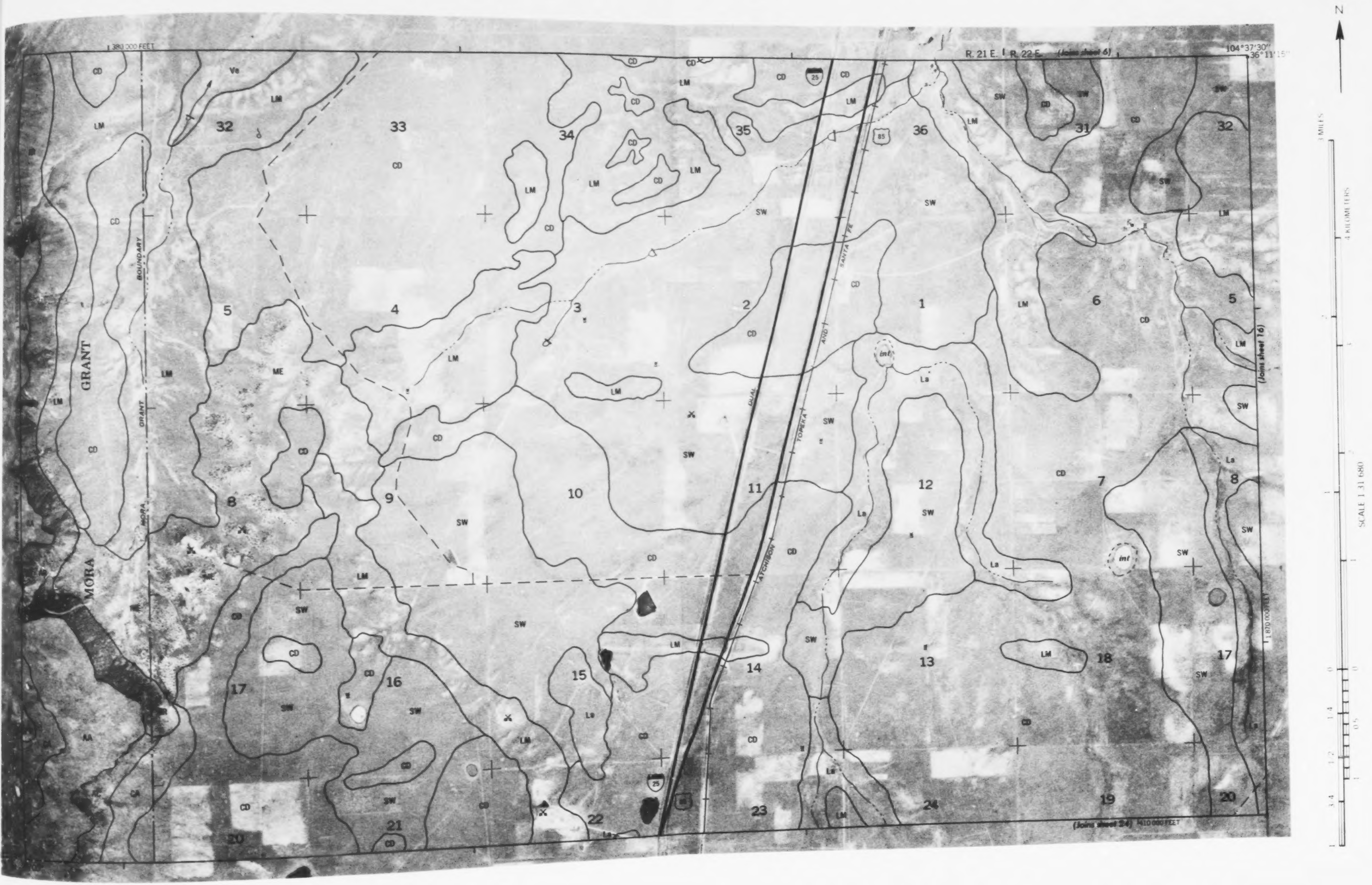

N
R. 18 E.
R. 19 E.
310 000 FEET
104°52'30"
36°11'15"
(Joins sheet 4)
(Joins sheet 14)
(Joins sheet 22)
APACHE
MESA
ENCINOSA
MESA
Los Naranjos
Airport
Ocate
Creek
MORA
GRANT
BOUNDARY
MOUNTAIN
ROUTE
SANTA FE TRAIL
120
Int
31
32
33
34
35
36
1
2
3
4
5
6
8
9
10
11
12
CA
AB
CC
AC
AR
AA
BA
PT

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 14



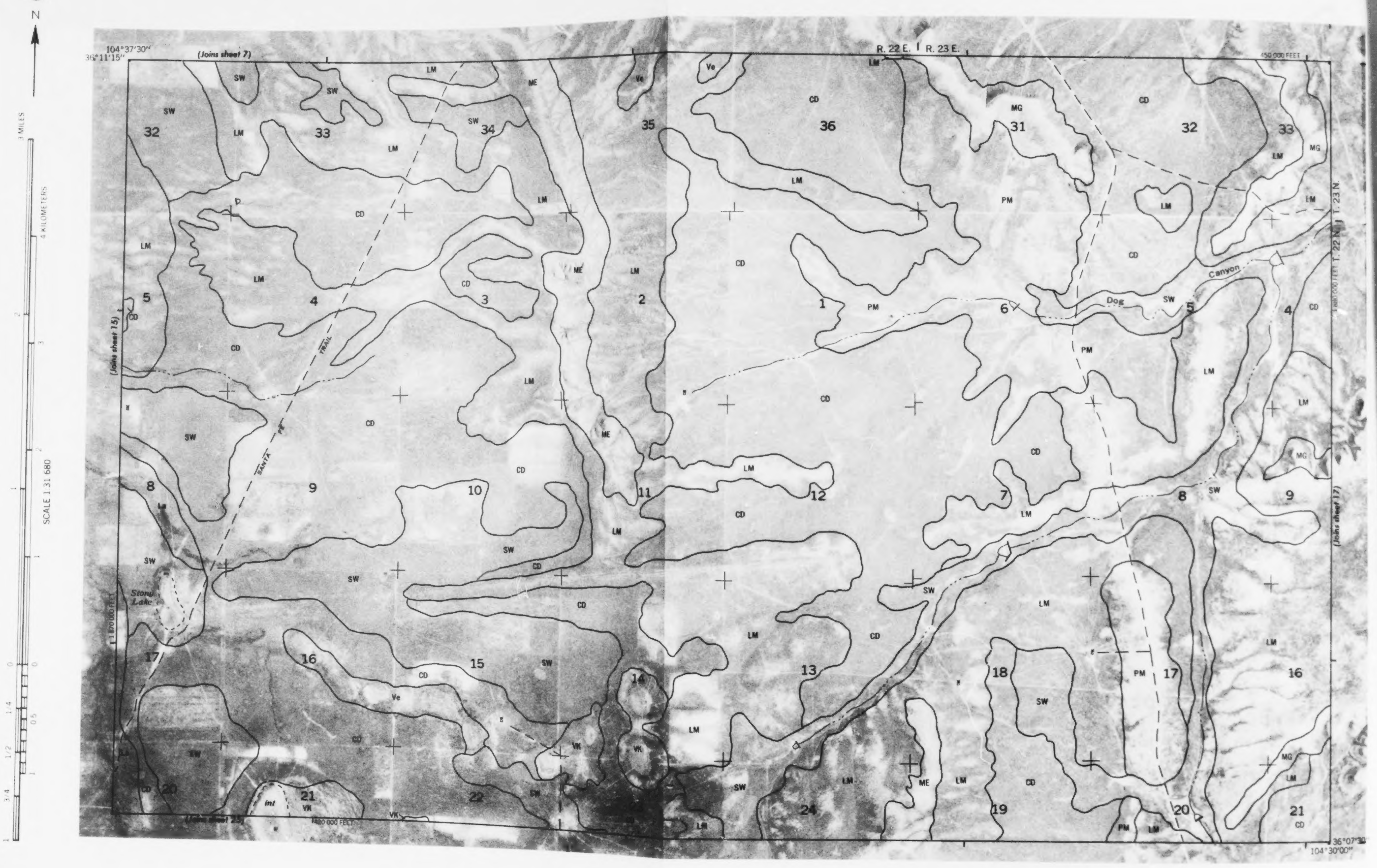
14
N
SCALE 1:31 680
MILES
KILOMETERS
104°22'30"
36°11'15"
R. 19 E. | R. 20 E.
(Joins sheet 5)
(Joins sheet 13)
(Joins sheet 15)
(Joins sheet 23)
370 000 FEET
1 870 000 FEET
1 880 000 FEET
350 000 FEET
T. 22 N. | T. 23 N.
36°07'30"
104°45'00"
CHARETTE
MESA
APACHE
MESA
Upper Charette Lake
SANTA FE TRAIL
MOUNTAIN ROUTE
CHARETTE LAKE DIVERSION CANAL
Ocate Creek
MORA
GRANT
569
AA
AB
AC
AR
CA
CC
LM
PT
Ve
int
1
3
4
5
6
7
8
9
12
13
17
18
31
32
33
35
36

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

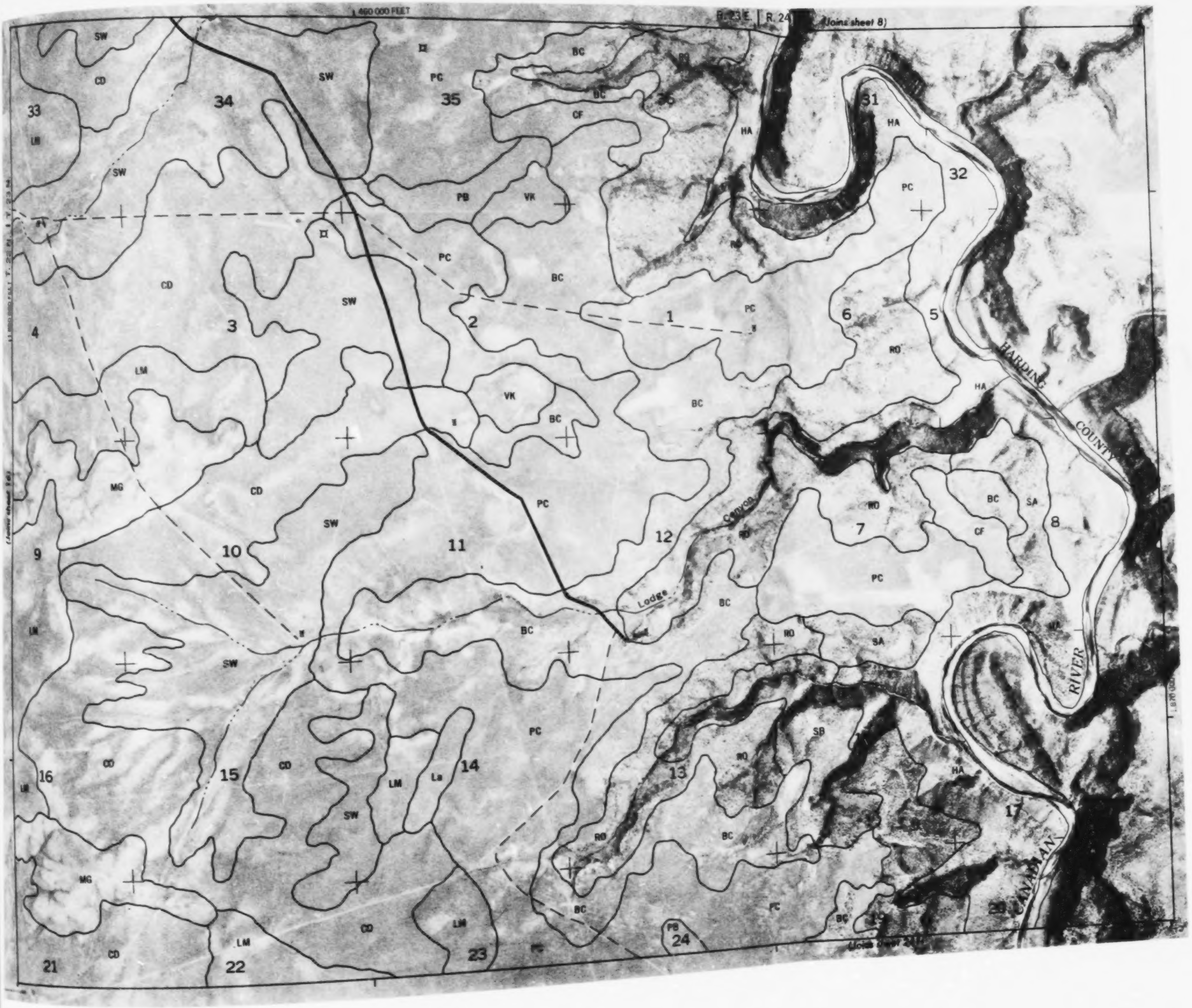

380 000 FEET
R. 21 E.
R. 22 E.
(Joins sheet 6)
104°37'30"
36°11'15"
(Joins sheet 16)
(Joins sheet 24)
410 000 FEET
1 870 000 FEET
N
GRANT
MORA
BOUNDARY
GRANT
MORA
ATCHISON
TOPEKA
AND
SANTA FE
DUAL
25
85
32
33
34
35
36
31
32
5
4
3
2
1
6
5
8
9
10
11
12
7
8
17
16
15
14
13
18
17
20
21
22
23
24
19
20
CD
LM
SW
La
ME
Ve
AA
CA
int
SCALE 1:31 680
1 MILES
4 KILOMETERS
0
1/4
1/2
3/4
1
0
0.5
1

⑯

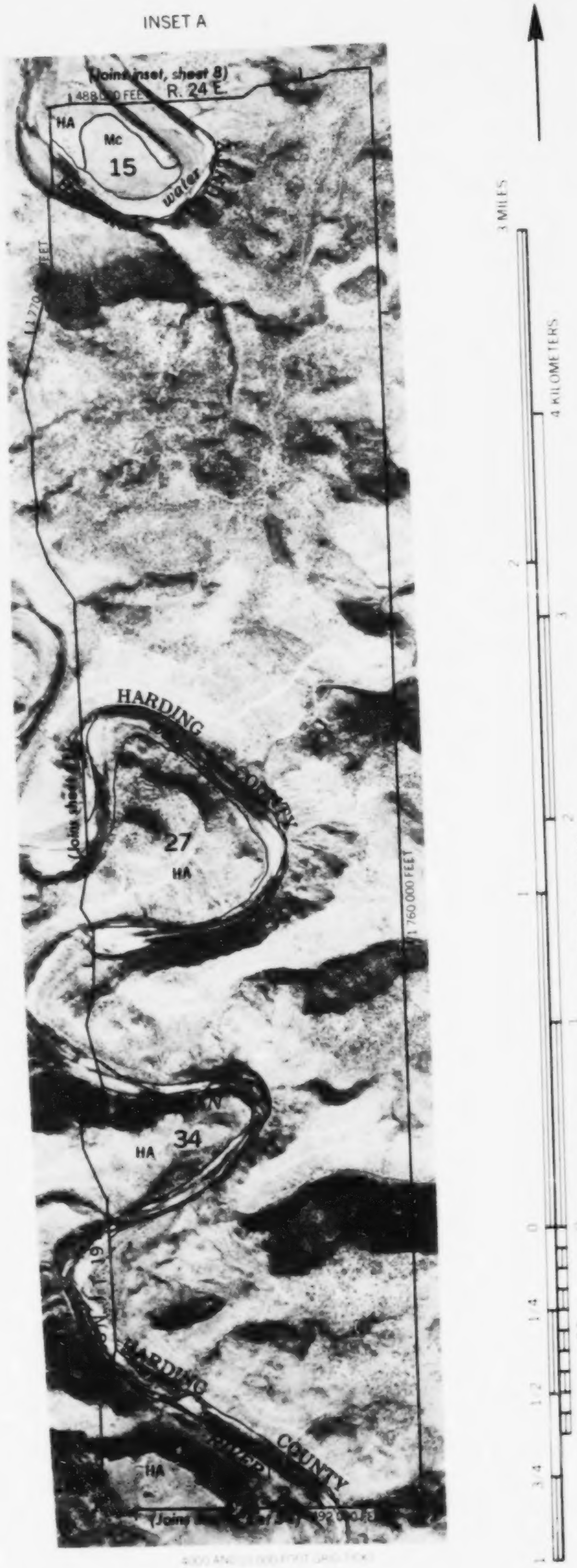
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 16



N
3 MILES
4 KILOMETERS
SCALE 1:31 680
104°37'30"
36°11'15"
(Joins sheet 7)
R. 22 E.
R. 23 E.
450 000 FEET
T. 23 N.
T. 22 N.
(Joins sheet 15)
(Joins sheet 17)
(Joins sheet 25)
1 870 000 FEET
1 820 000 FEET
36°07'30"
104°30'00"
SANTA FE TRAIL
Dog Canyon
Stony Lake
CD
LM
SW
ME
MG
PM
Ve
VK
La
int
32
33
34
35
36
31
5
4
3
2
1
6
8
9
10
11
12
7
17
16
15
14
13
18
20
21
22
24
19

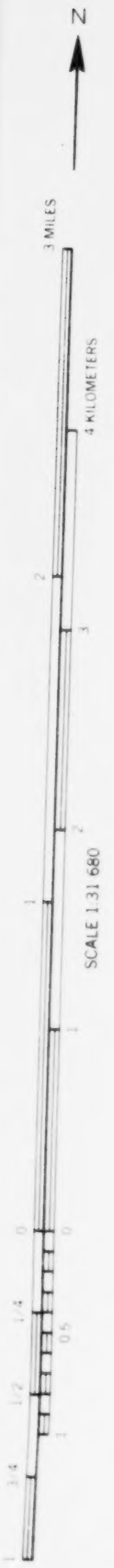

460 000 FEET
R. 23 E.
R. 24 E.
(Joins sheet 8)
(Joins sheet 16)
(Joins sheet 24)
HARDING COUNTY
CANADIAN RIVER
Lodge Canyon
SW
CD
PC
BC
CF
HA
PB
VK
RO
LM
MG
SA
SB
La
33
34
35
36
31
32
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
19
20
21
22
23
24

INSET A

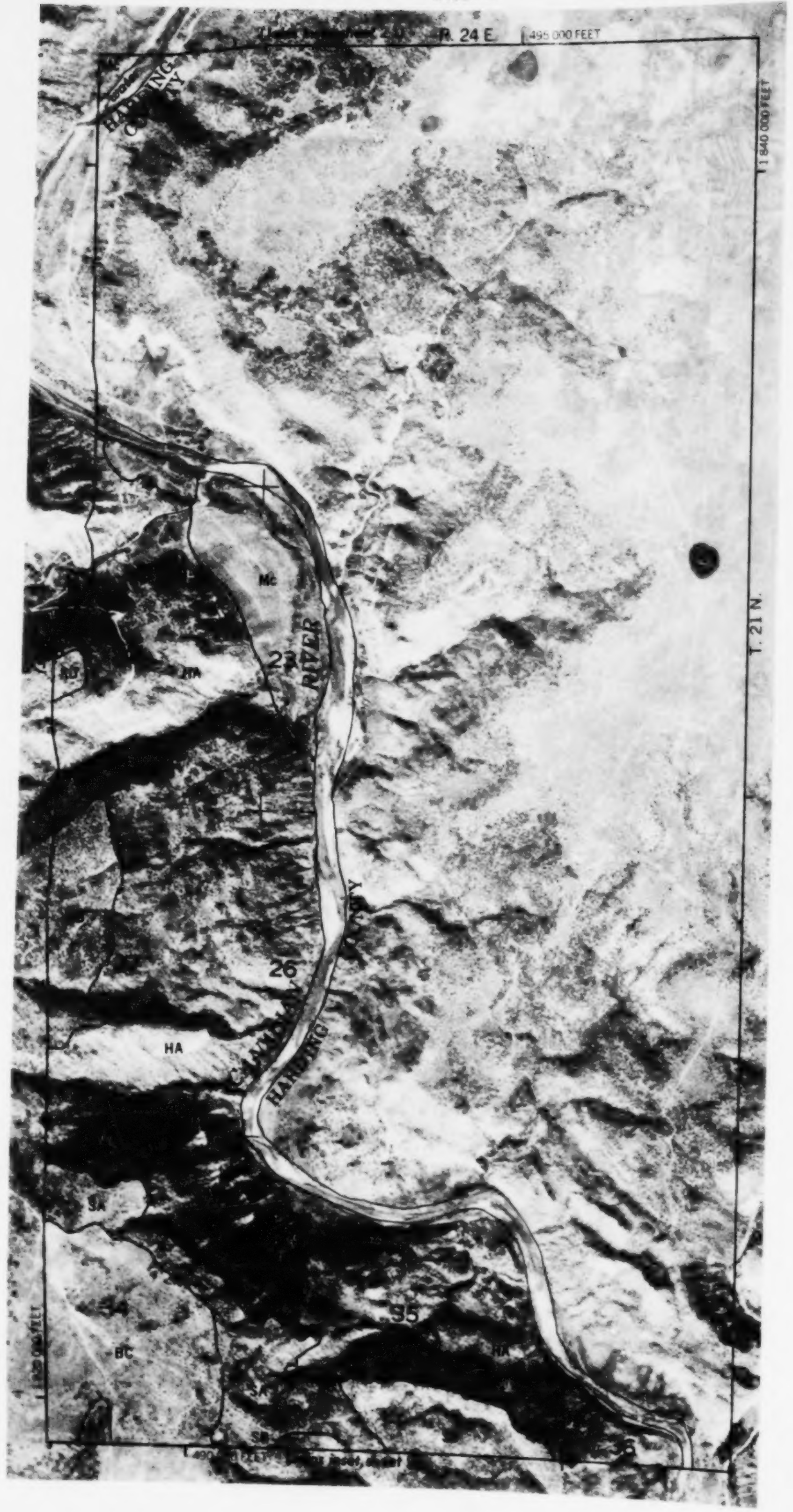

N
(Joins inset, sheet 8)
R. 24 E.
HA
Mc
15
HARDING COUNTY
27
34
19
3 MILES
4 KILOMETERS
SCALE 1:31 680

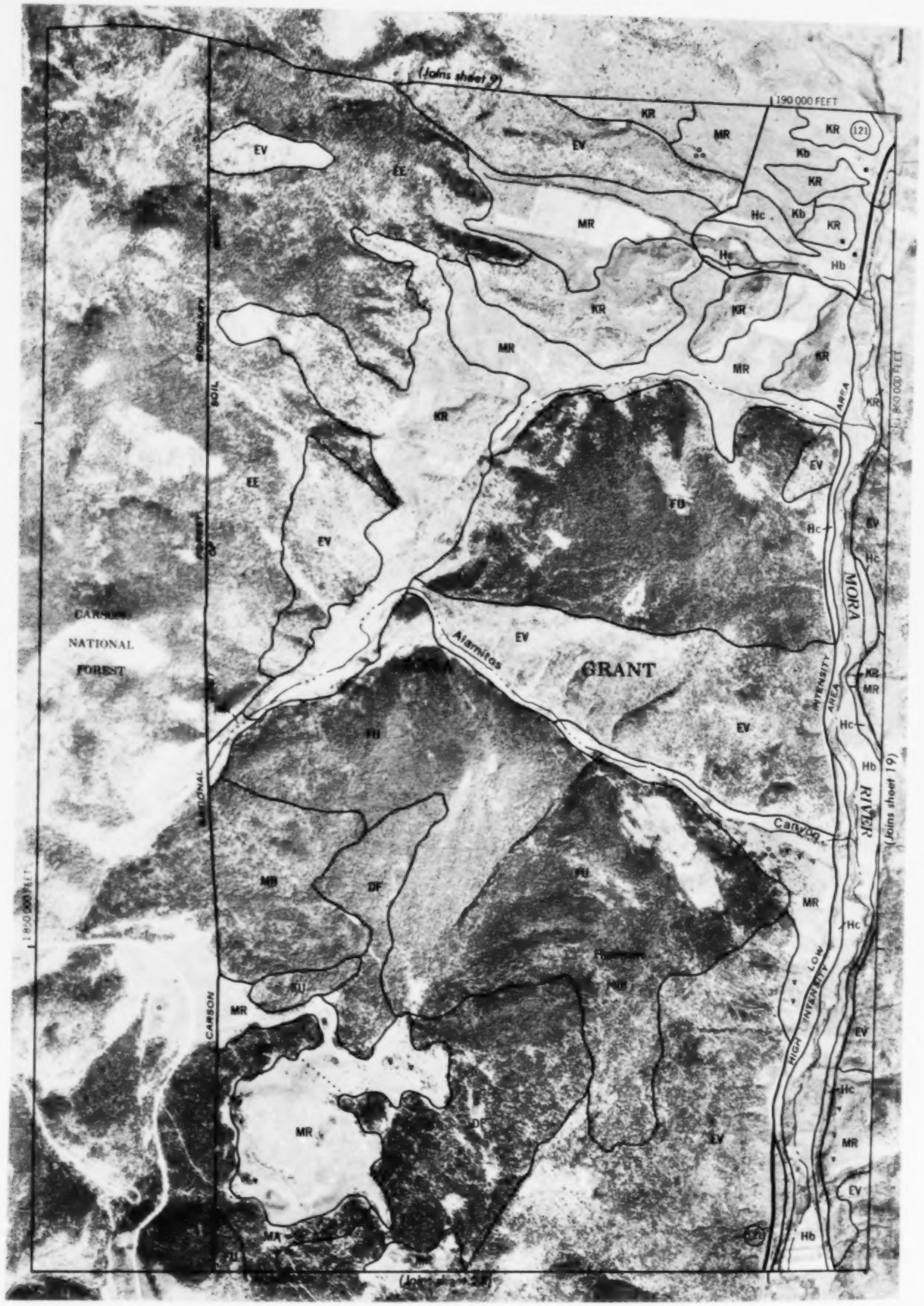
⑱

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 18


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
2
3
1
2
1
0
1/4
0.5
1/2
1
3/4

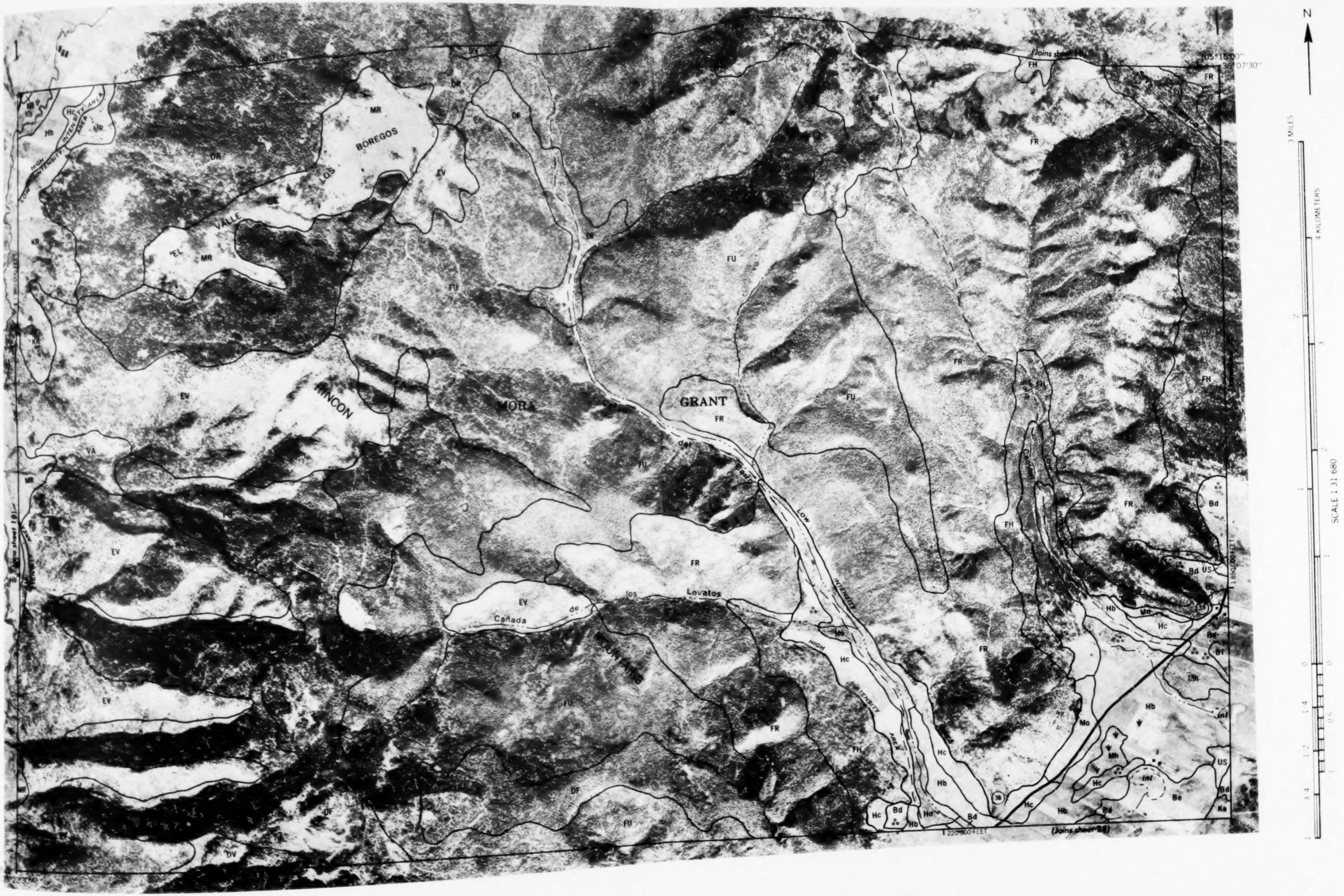
INSET A

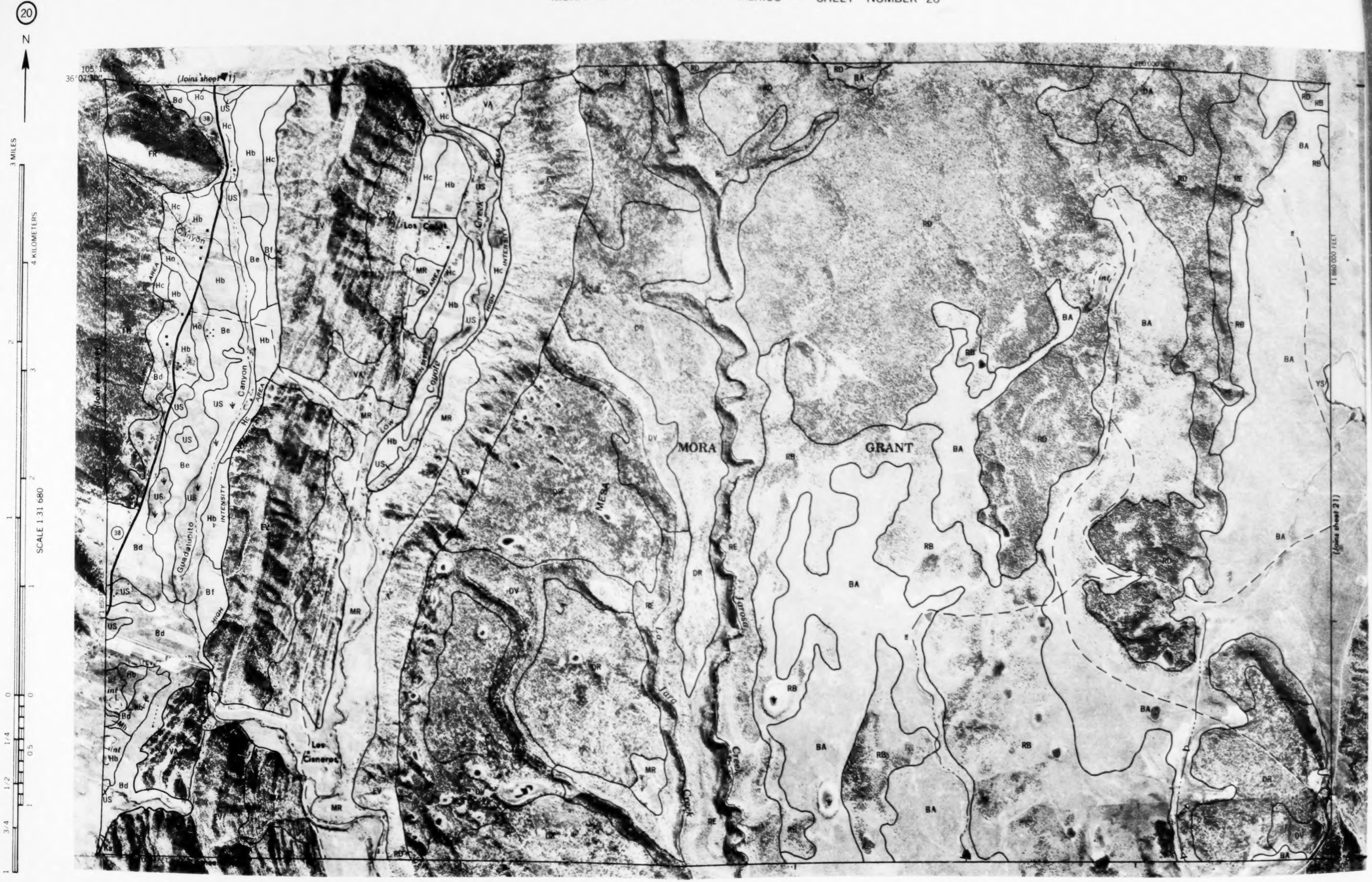

(Joins sheet 24)
R. 24 E.
1 495 000 FEET
1 840 000 FEET
HARDING COUNTY
T. 21 N.
Mc
23
RIVER
BD
HA
26
CANADIAN
HARDING COUNTY
HA
SA
35
34
BC
36


(Joins sheet 9)
1 190 000 FEET
KR
MR
KR
121
Kb
KR
EV
EE
Hc
Kb
KR
MR
Hc
Hb
KR
MR
KR
MR
KR
KR
EE
EV
FU
EV
Hc
EV
Hc
MORA
CARSON
NATIONAL
FOREST
Alamitos
EV
MORA
GRANT
Kb
MR
FU
EV
Hc
Hb
Canyon
(Joins sheet 19)
RIVER
MR
DF
FU
MR
Hc
MR
FU
MR
LOW INTENSITY AREA
HIGH INTENSITY AREA
MR
DF
EV
Hc
MR
EV
MA
Hb
NATIONAL FOREST BOUNDARY
SOIL SURVEY AREA BOUNDARY
CARSON
1 850 000 FEET
1 850 000 FEET
(Joins sheet 27)

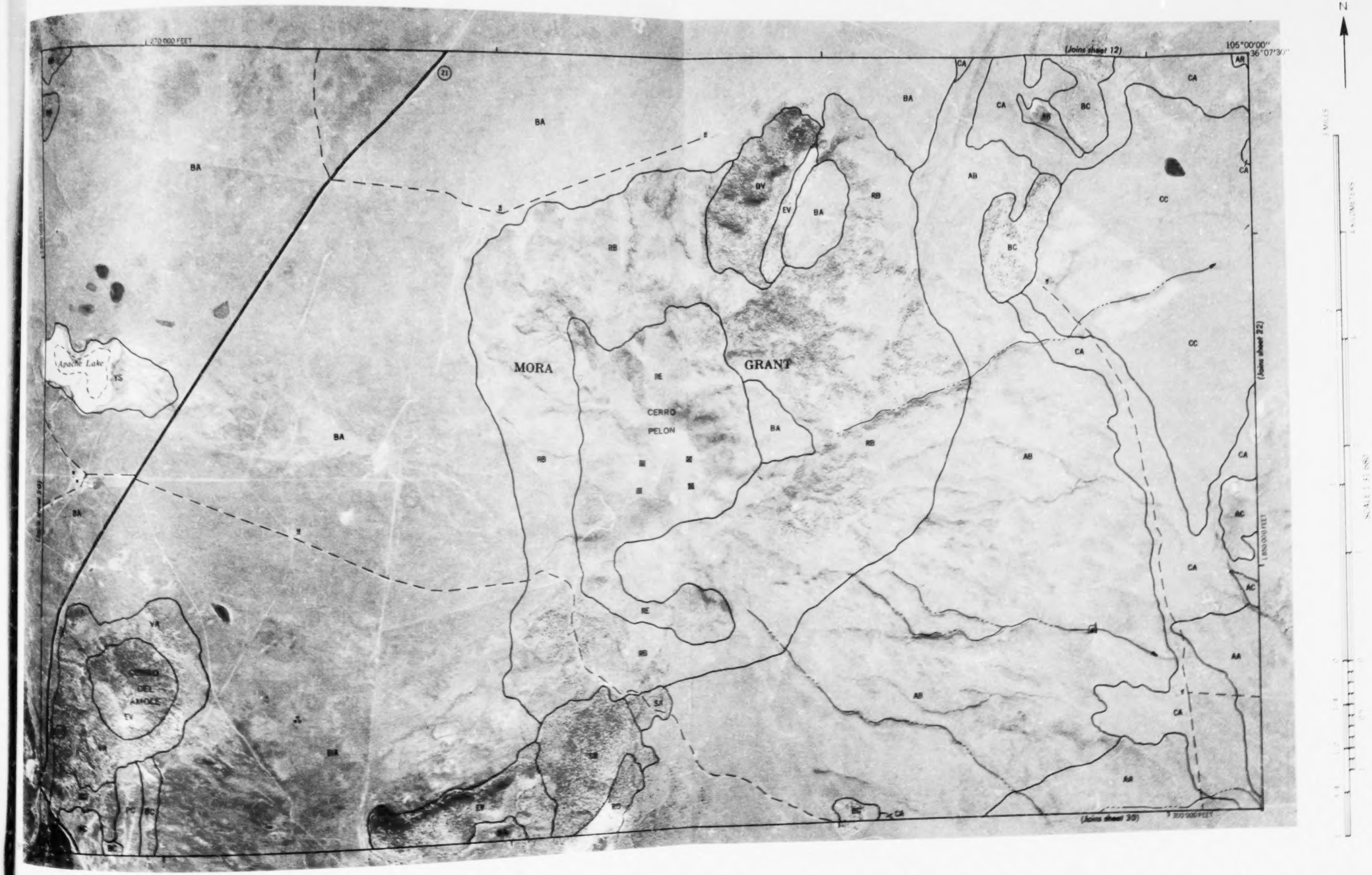
[illegible] compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating [illegible]

36°0

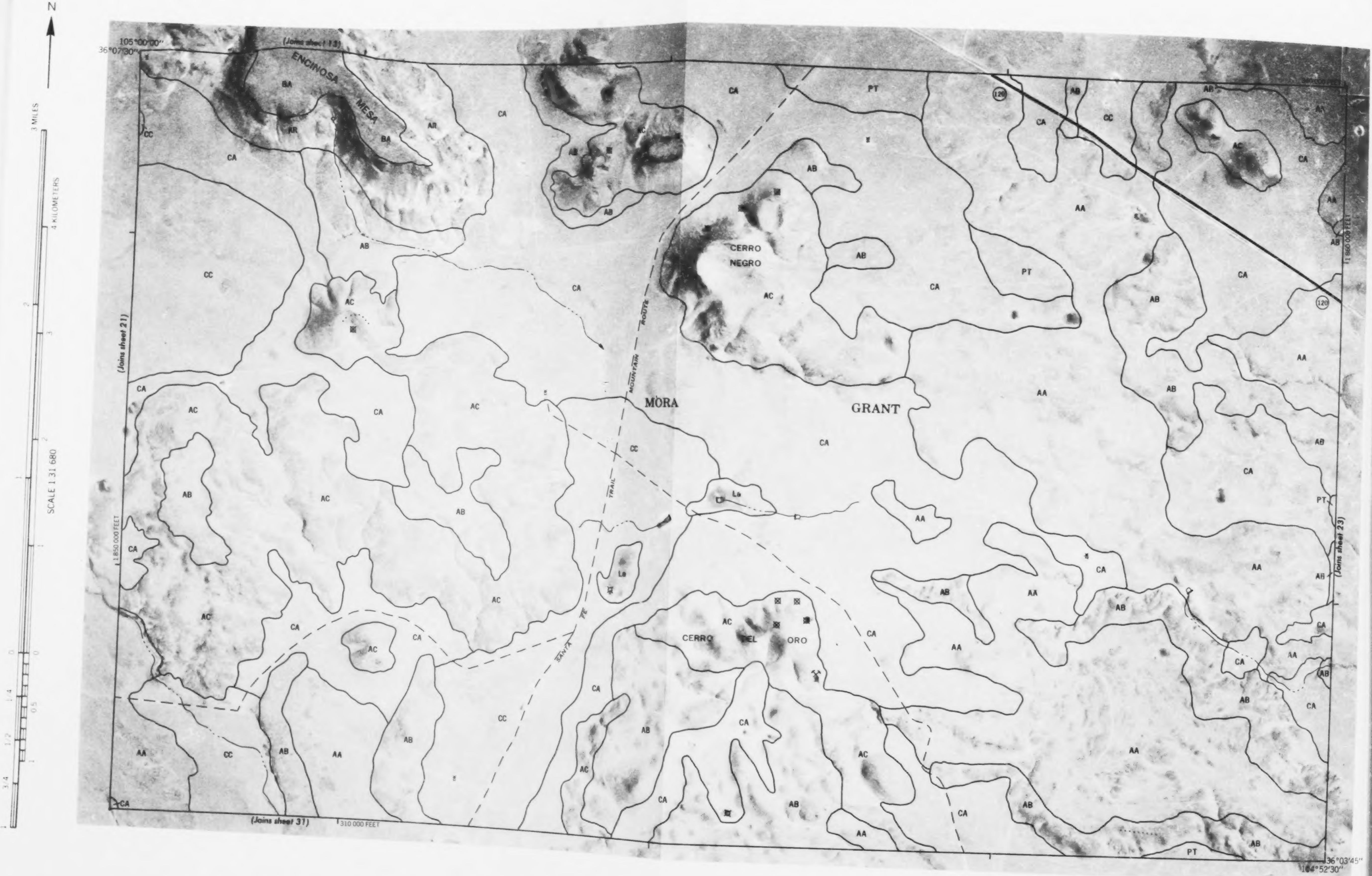

N
(Joins sheet 11)
105°15'00"
36°07'30"
LOS BOREGOS
EL VALLE
RINCON
MORA
GRANT
del
Cañada de los Lovatos
MOUNTAINS
LOW INTENSITY AREA
HIGH INTENSITY AREA
MR
Hb
Hc
DR
EV
VA
FU
FR
FH
DF
DV
Bd
US
Mo
Mh
Be
Ka
Br
Int
(Joins sheet 18)
(Joins sheet 20)
220 000 FEET
1 850 000 FEET
3 MILES
4 KILOMETERS
SCALE 1:31 680



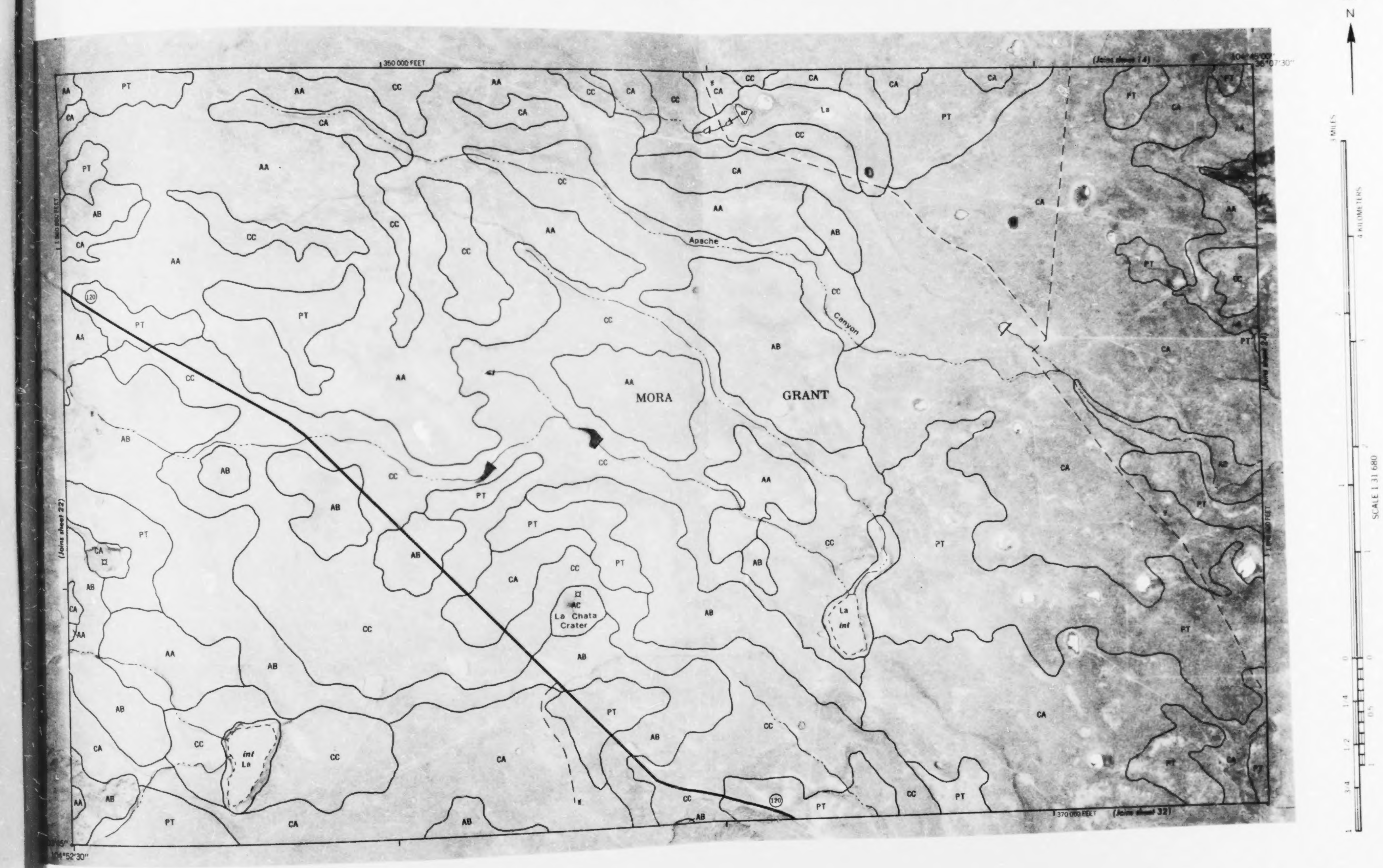
⑳
N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°15'
36°07'30"
(Joins sheet 11)
(Joins sheet 21)
(Joins sheet 19)
1 860 000 FEET
1 850 000 FEET
280 000 FEET
Los Cerros
Los Cieneros
Canyon
Guadalupito
Coyote
Creek
Jarosa
Creek
La Jara
Creek
MESA
MORA
GRANT
HIGH INTENSITY AREA
LOW INTENSITY AREA
38
Bd
Ho
US
Hc
Hb
FR
Be
Bf
VA
EV
MR
DR
DV
RD
BA
RB
RE
YS
int
Mh


N
270 000 FEET
(Joins sheet 12)
105°00'00"
36°07'30"
(Joins sheet 22)
(Joins sheet 39)
300 000 FEET
1 850 000 FEET
21
MORA
GRANT
CERRO
PELON
Apache Lake
CERRO
DEL
AMOLE
BA
RB
DV
EV
BC
CA
CC
AB
AC
AA
AR
YS
RE
SA
VA

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 22

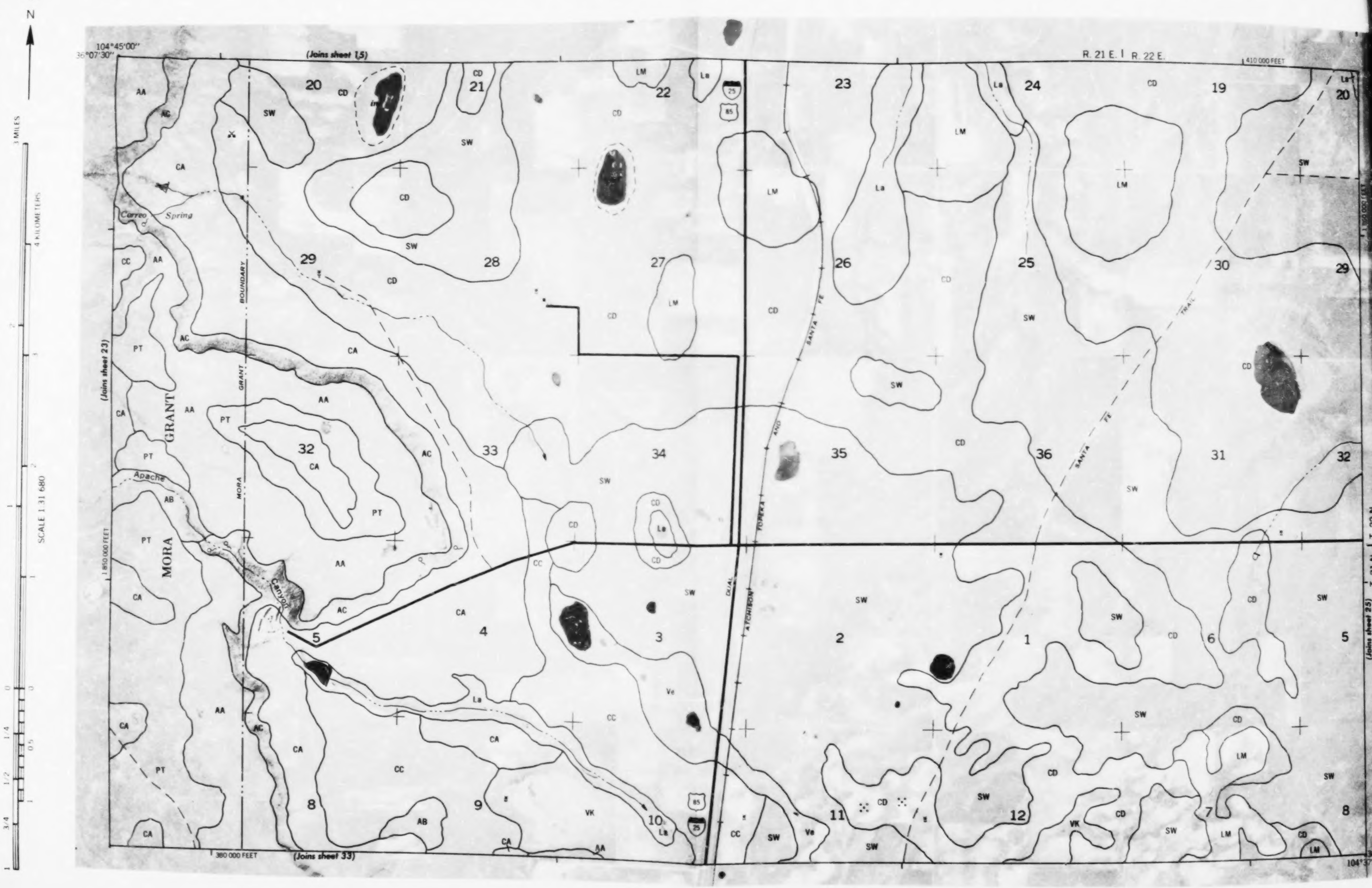

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°00'00"
36°07'30"
(Joins sheet 13)
(Joins sheet 21)
(Joins sheet 23)
(Joins sheet 31)
1 850 000 FEET
1 860 000 FEET
310 000 FEET
36°03'45"
104°52'30"
ENCINOSA MESA
CERRO NEGRO
CERRO DEL ORO
MORA
GRANT
SANTA FE TRAIL
MOUNTAIN ROUTE
120
CC
CA
BA
AR
AB
AC
CC
PT
AA
Le

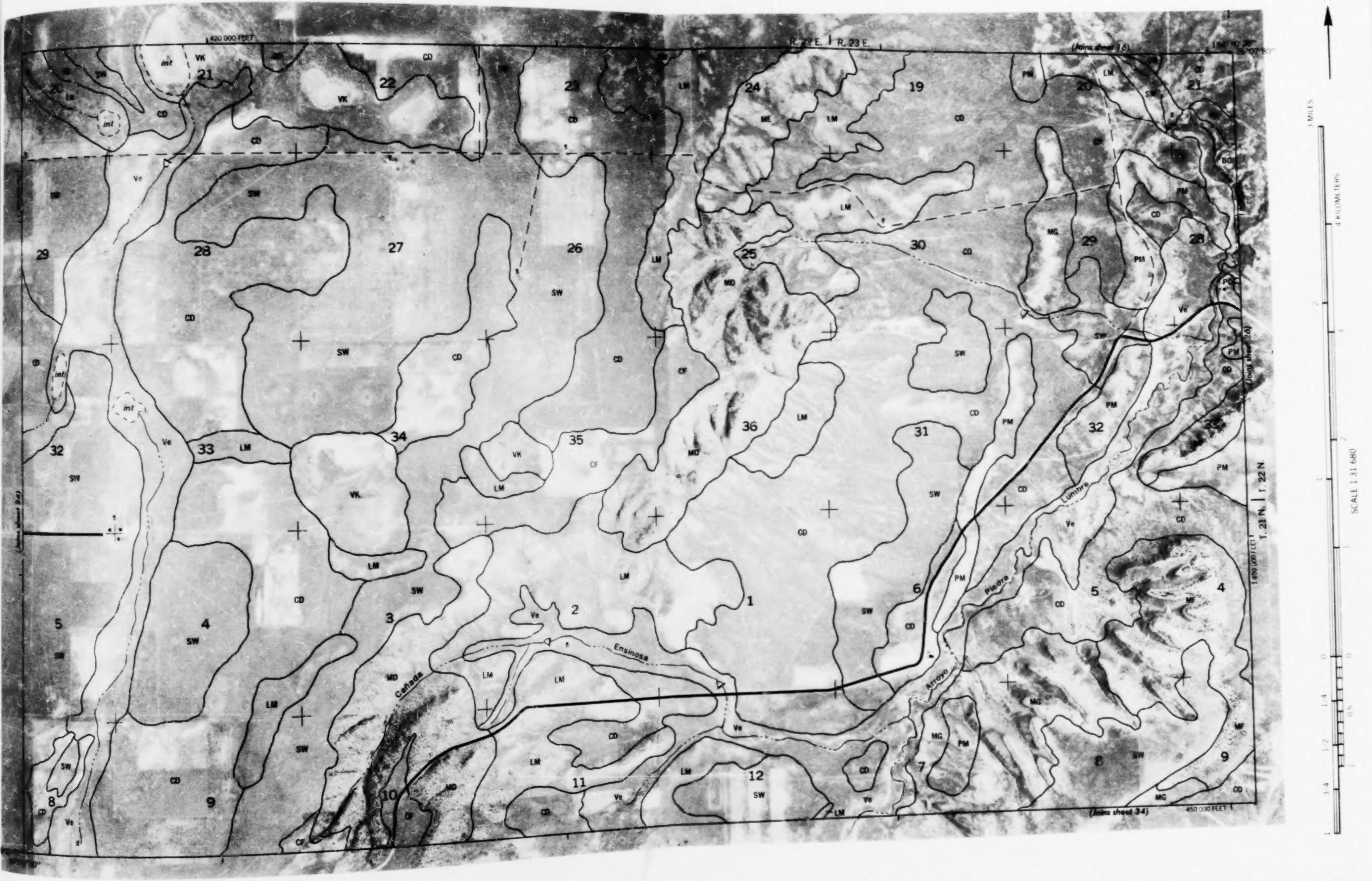
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 23


350 000 FEET
(Joins sheet 14)
104°45'00"
36°07'30"
(Joins sheet 22)
(Joins sheet 24)
(Joins sheet 32)
370 000 FEET
36°05'
104°52'30"
MORA
GRANT
Apache
Canyon
La Chata
Crater
120
AA
AB
AC
CA
CC
PT
La
int
N
3 MILES
4 KILOMETERS
SCALE 1:31 680

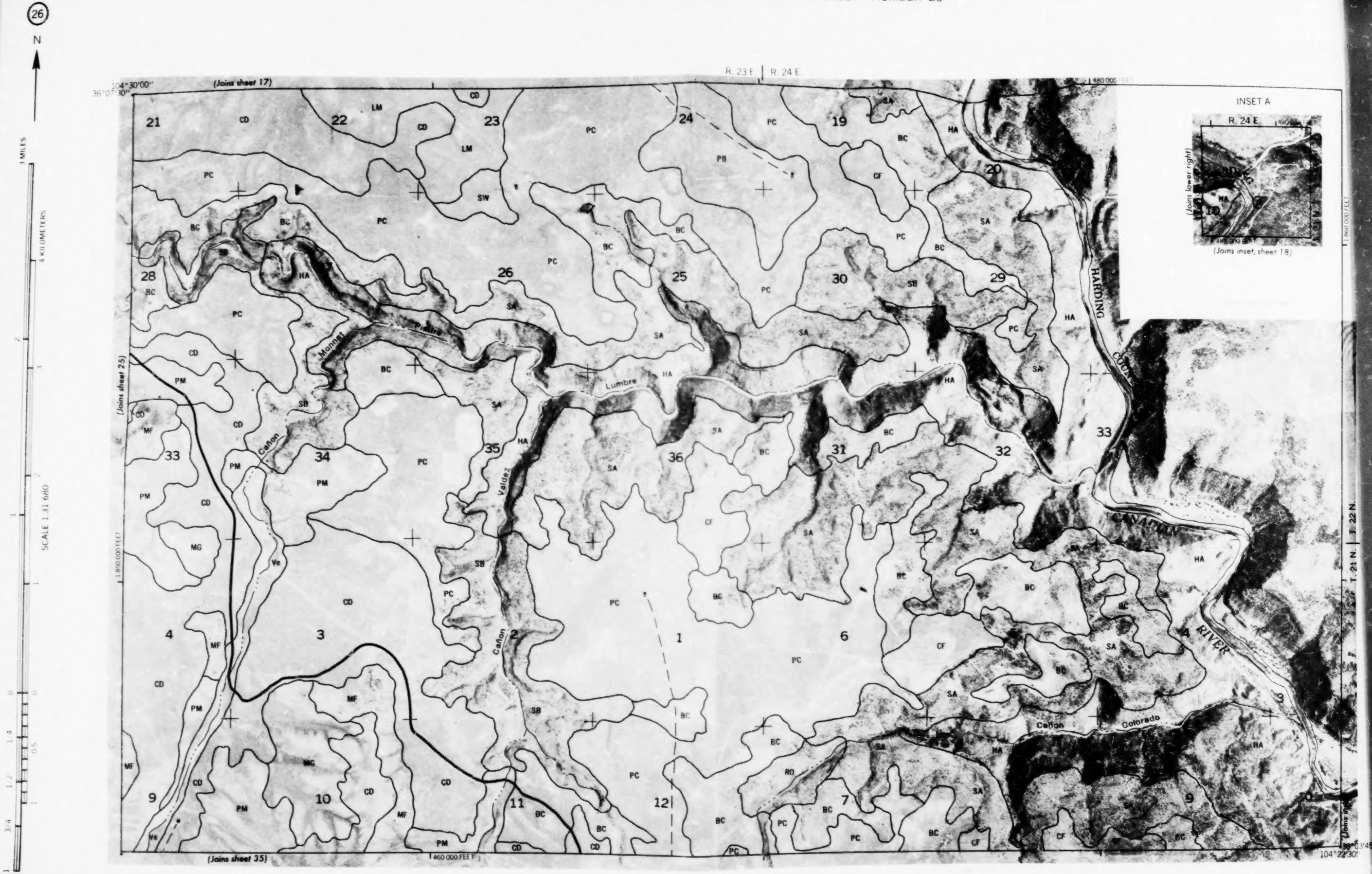
㉔

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 24

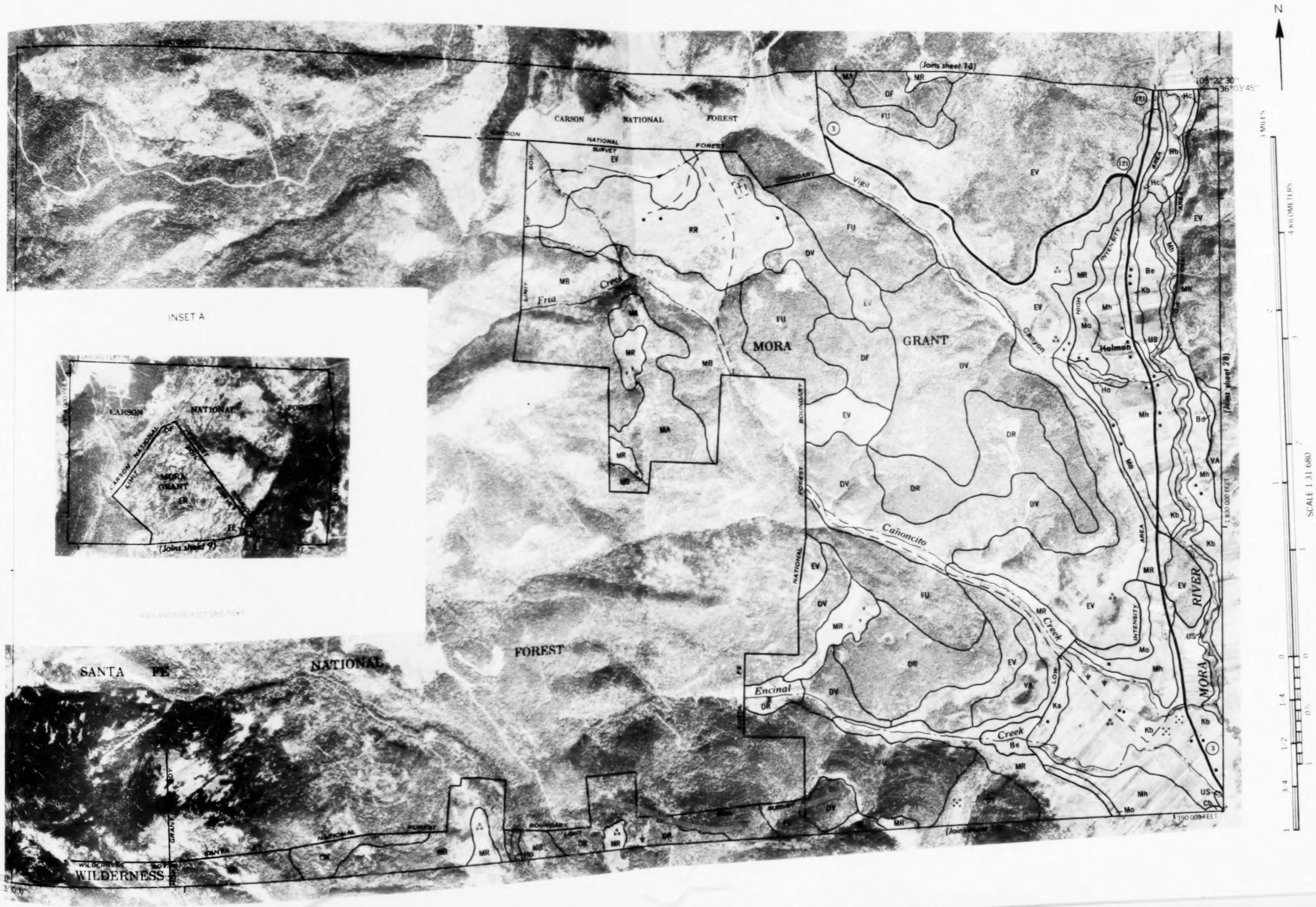

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
104°45'00"
36°07'30"
(Joins sheet 15)
(Joins sheet 23)
(Joins sheet 25)
(Joins sheet 33)
R. 21 E. | R. 22 E.
T. 22 N. | T. 21 N.
410 000 FEET
1 850 000 FEET
380 000 FEET
36°03'45"
104°37'30"
GRANT
MORA
MORA GRANT BOUNDARY
Carreo Spring
Apache Canyon
ATCHISON TOPEKA AND SANTA FE
SANTA FE TRAIL
25
85
20 21 22 23 24 19 20
29 28 27 26 25 30 29
32 33 34 35 36 31 32
5 4 3 2 1 6 5
8 9 10 11 12 7 8
AA AC CA CC CD PT SW AB LM La VK Va


N
420 000 FEET
R. 22 E.
R. 23 E.
(Joins sheet 16)
(Joins sheet 24)
(Joins sheet 26)
(Joins sheet 34)
450 000 FEET
1 850 000 FEET
T. 21 N.
T. 22 N.
Cañada
Ensinosa
Arroyo
Piedra
Lumbre
CD
SW
LM
VK
Ve
MD
MG
MF
ME
PM
CF
BO
ml
1
2
3
4
5
6
7
8
9
10
11
12
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
3
4

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 26

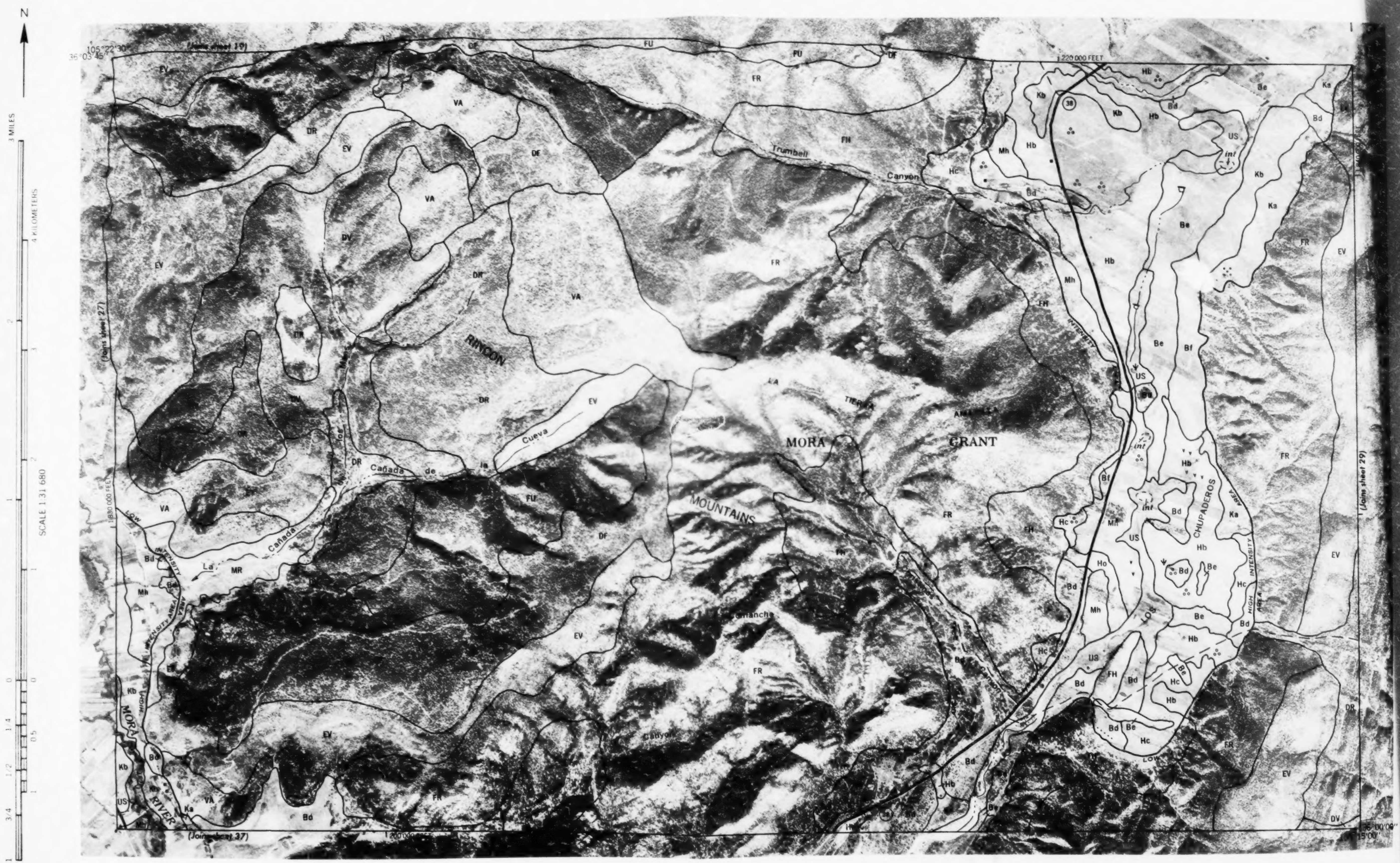

26
N
3 MILES
4 KILOMETERS
SCALE 1:31 680
R. 23 E.
R. 24 E.
104°30'00"
36°07'30"
(Joins sheet 17)
(Joins sheet 25)
(Joins sheet 35)
480 000 FEET
460 000 FEET
1 860 000 FEET
1 850 000 FEET
T. 22 N.
T. 21 N.
104°22'30"
36°03'45"
INSET A
R. 24 E.
(Joins lower right)
(Joins inset, sheet 18)
HARDING
CANADIAN
RIVER
Cañon Monnet
Piedra
Lumbre
Cañon Valdez
Cañon
Cañon Colorado
CD
LM
PC
PB
SA
BC
HA
CF
SW
SB
PM
MF
MG
Ve
RO
BO

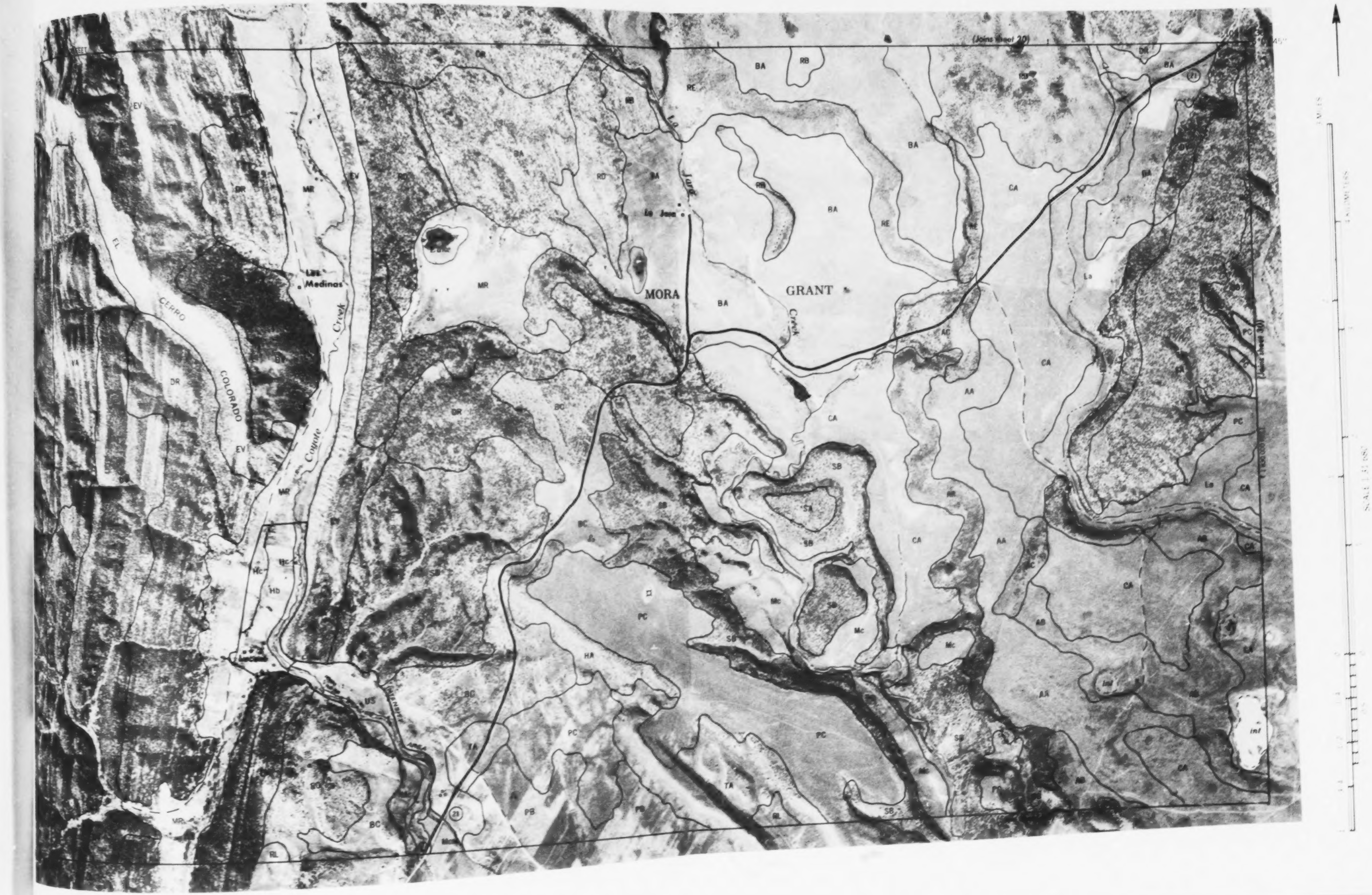
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 27


N
(Joins sheet 13)
105°22'30"
36°03'45"
CARSON NATIONAL FOREST
CARSON NATIONAL SURVEY FOREST BOUNDARY
LIMIT OF SOIL SURVEY
Vigil Canyon
Fria Creek
MORA GRANT
Cañoncito Creek
Encinal Creek
Holman
MORA RIVER
HIGH INTENSITY AREA
LOW INTENSITY AREA
NATIONAL FOREST BOUNDARY
(Joins sheet 28)
1 830 000 FEET
190 000 FEET
SANTA FE NATIONAL FOREST
WILDERNESS
INSET A
CARSON NATIONAL FOREST
MORA GRANT
(Joins sheet 9)
3
121
EV
MA
MR
DF
FU
FR
DV
MB
DR
VA
Ka
Kb
Be
Bd
Hc
Hb
Ho
Mh
Mo
US
Cb
EE
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2

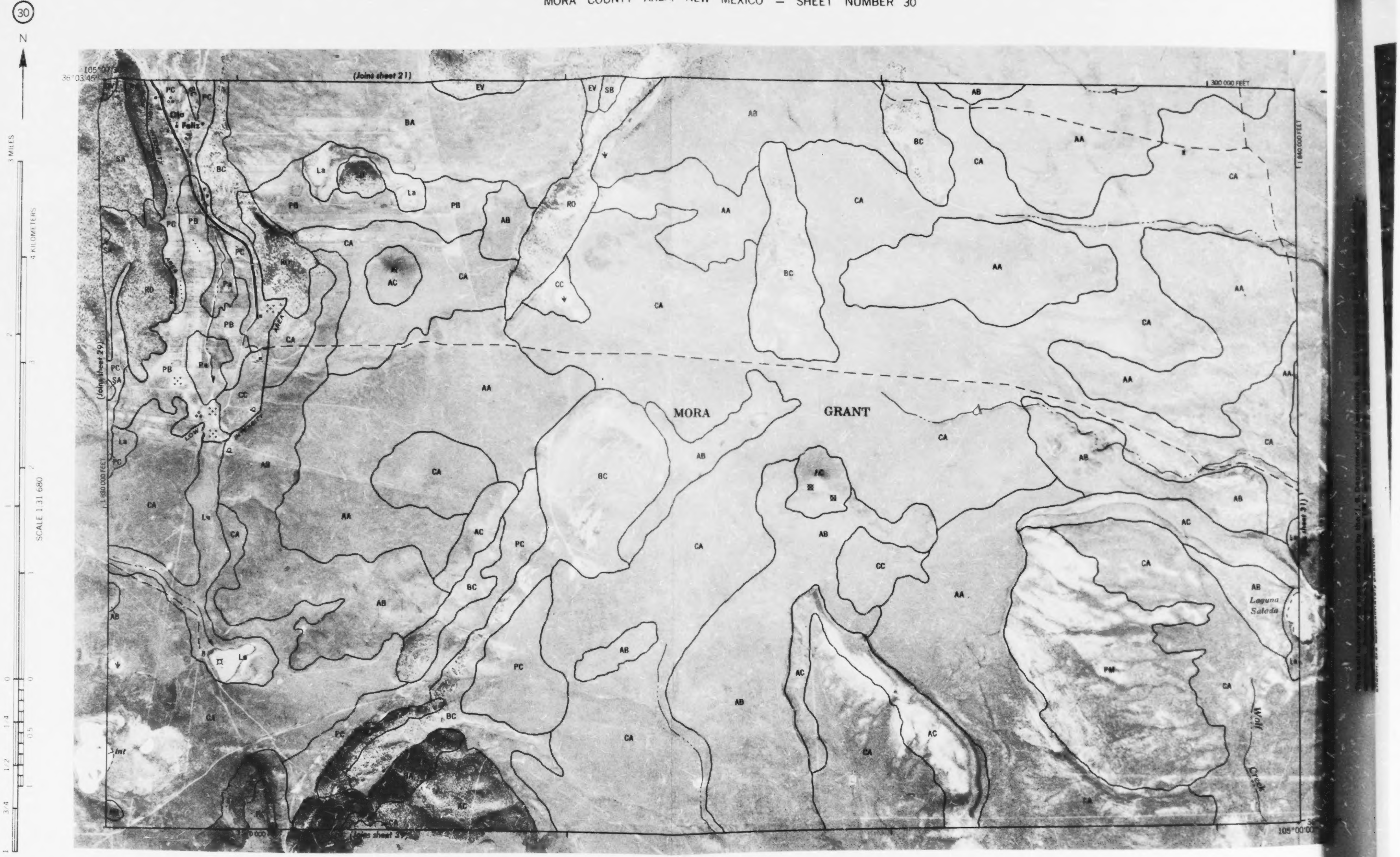
㉘

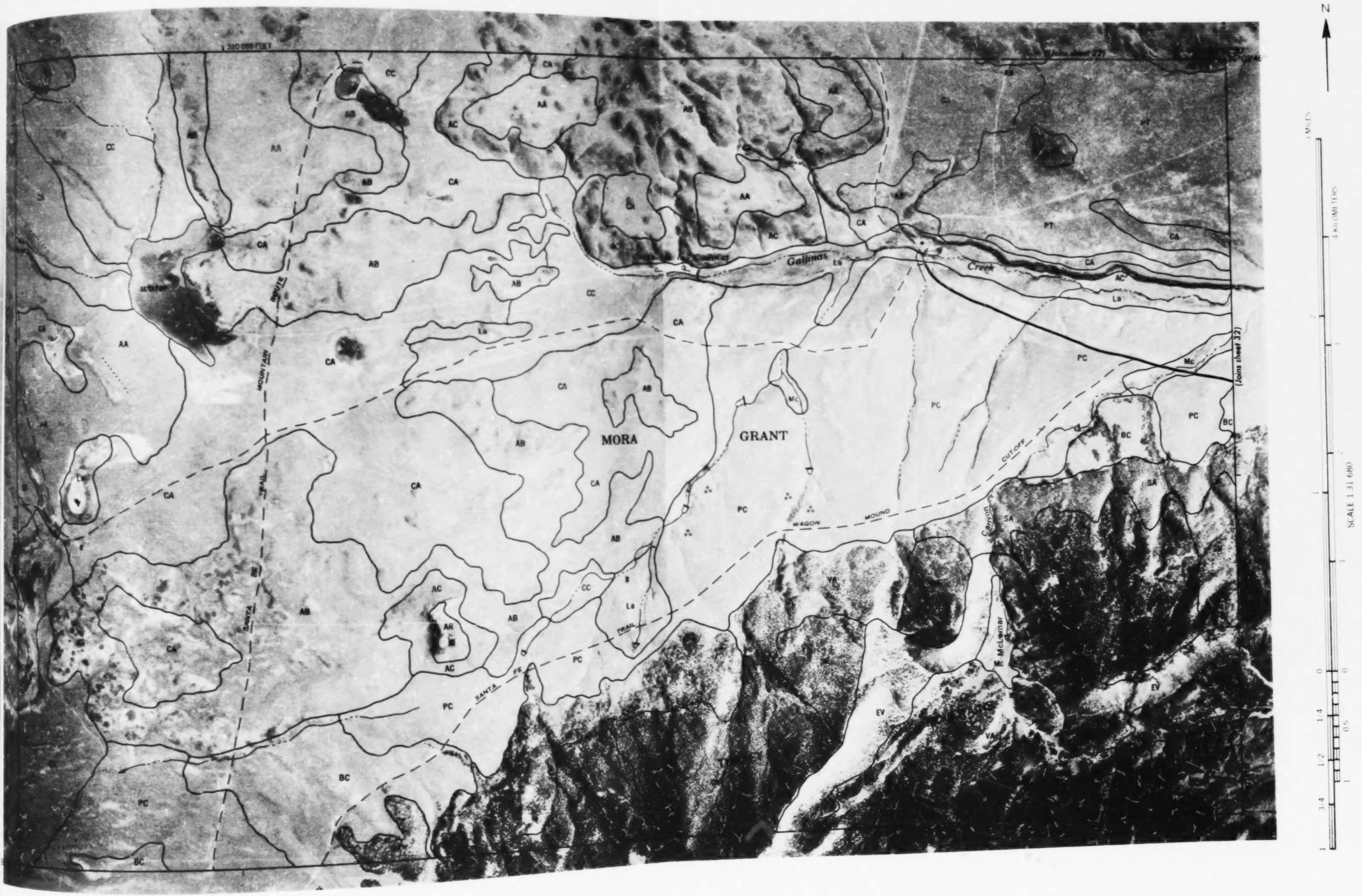
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 28


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°22'30"
36°03'45"
(Joins sheet 19)
220 000 FEET
(Joins sheet 27)
1 830 000 FEET
(Joins sheet 29)
(Joins sheet 37)
200 000 FEET
36°00'08"
105°15'00"
Trumbell Canyon
RINCON
Cueva
Cañada de la
La Cañada
MORA GRANT
TIERRA AMARILLA
MOUNTAINS
CHUPADEROS
Canyon
LOW INTENSITY AREA
HIGH INTENSITY AREA
MORA RIVER
38
EV
DR
VA
DF
DV
FU
FR
FN
FH
MR
Mh
Hb
Hc
Ho
Kb
Ka
Bd
Be
Bf
US
int


N
(Joins sheet 20)
MORA
GRANT
La Jara
La Jara Creek
Las Medinas
EL CERRO COLORADO
Coyote Creek
BA
RB
RE
DR
EV
MR
RD
CA
AA
AB
AC
PC
PB
SB
SA
Mc
Hb
Hc
BC
TA
HA
La
Inf
RL
US
71
21

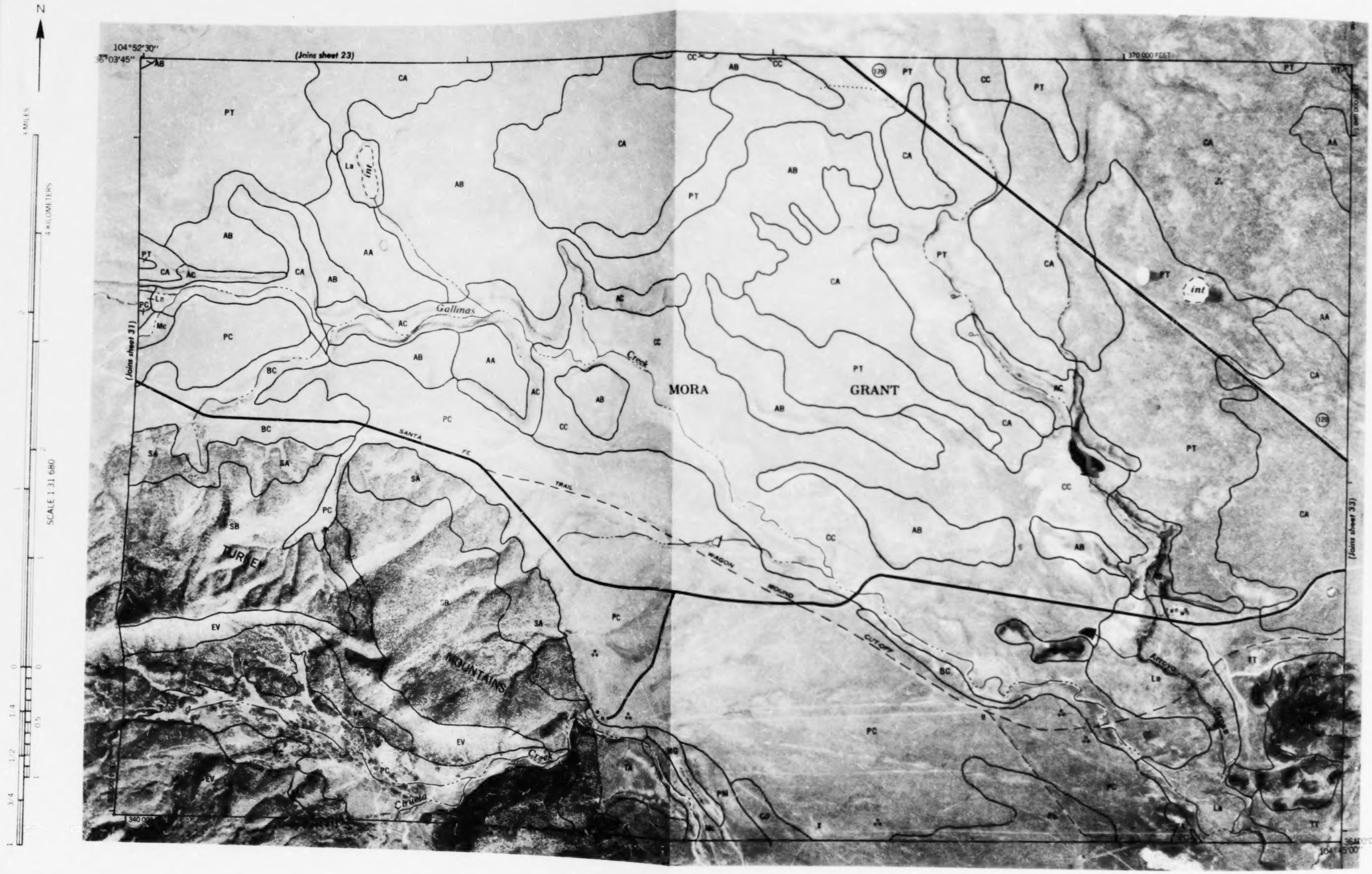
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 30


30
N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°07'30"
36°03'45"
(Joins sheet 21)
(Joins sheet 29)
(Joins sheet 31)
(Joins sheet 39)
300 000 FEET
1 880 000 FEET
1 860 000 FEET
105°00'00"
Ojo Feliz
MORA
GRANT
Laguna Salada
Wolf Creek
AREA
LOW
BA
EV
SB
AB
BC
CA
AA
La
PB
PC
RO
CC
AC
SA
RD
Pa
fC
PM
Int
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation
shown are approximately positioned.


N
320 000 FEET
(Joins sheet 22)
(Joins sheet 32)
MORA
GRANT
Gallinas
Creek
Water
MOUNTAIN ROUTE
SANTA FE TRAIL
SANTA FE TRAIL
WAGON MOUND CUT-OFF
Cañon
M. McLemar
CC
AA
AB
AC
CA
La
Mc
PC
PT
BC
SA
SB
VA
EV
AR
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
3
4
0.5

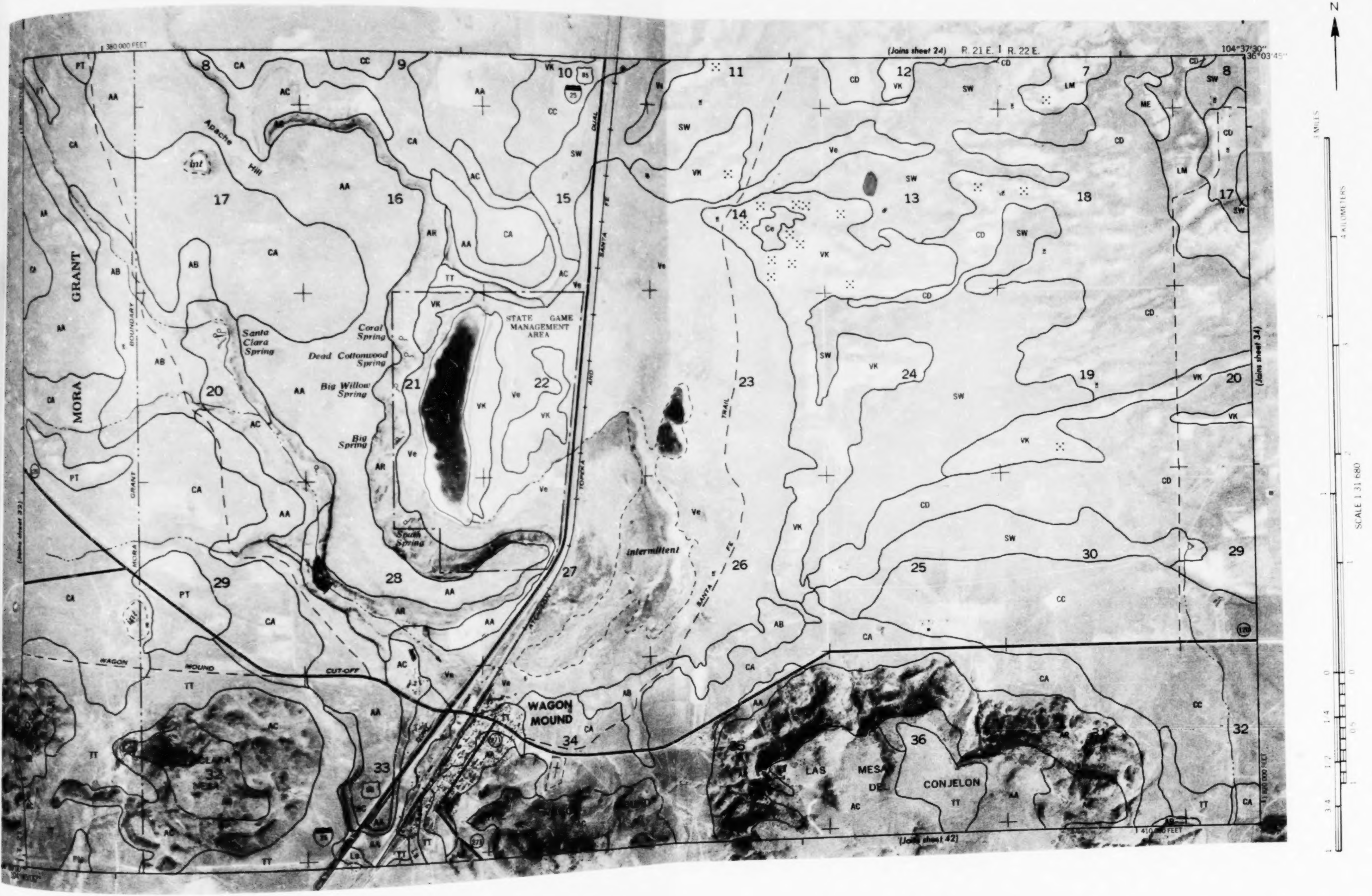
㉜

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 32


N
SCALE 1:31 680
1 MILES
4 KILOMETERS
3/4
1/2
1/4
0
1
2
3
0.5
104°52'30"
36°03'45"
(Joins sheet 23)
(Joins sheet 31)
(Joins sheet 33)
370 000 FEET
340 000
36°00'00"
104°45'00"
120
MORA
GRANT
Gallinas
Creek
SANTA FE TRAIL
WAGON MOUND CUTOFF
TURKEY
MOUNTAINS
Creek
Ciruela
Arroyo
AB
CA
PT
CC
AA
AC
La
Int
PC
Mc
BC
SA
SB
EV
TT
MG
PM
CP

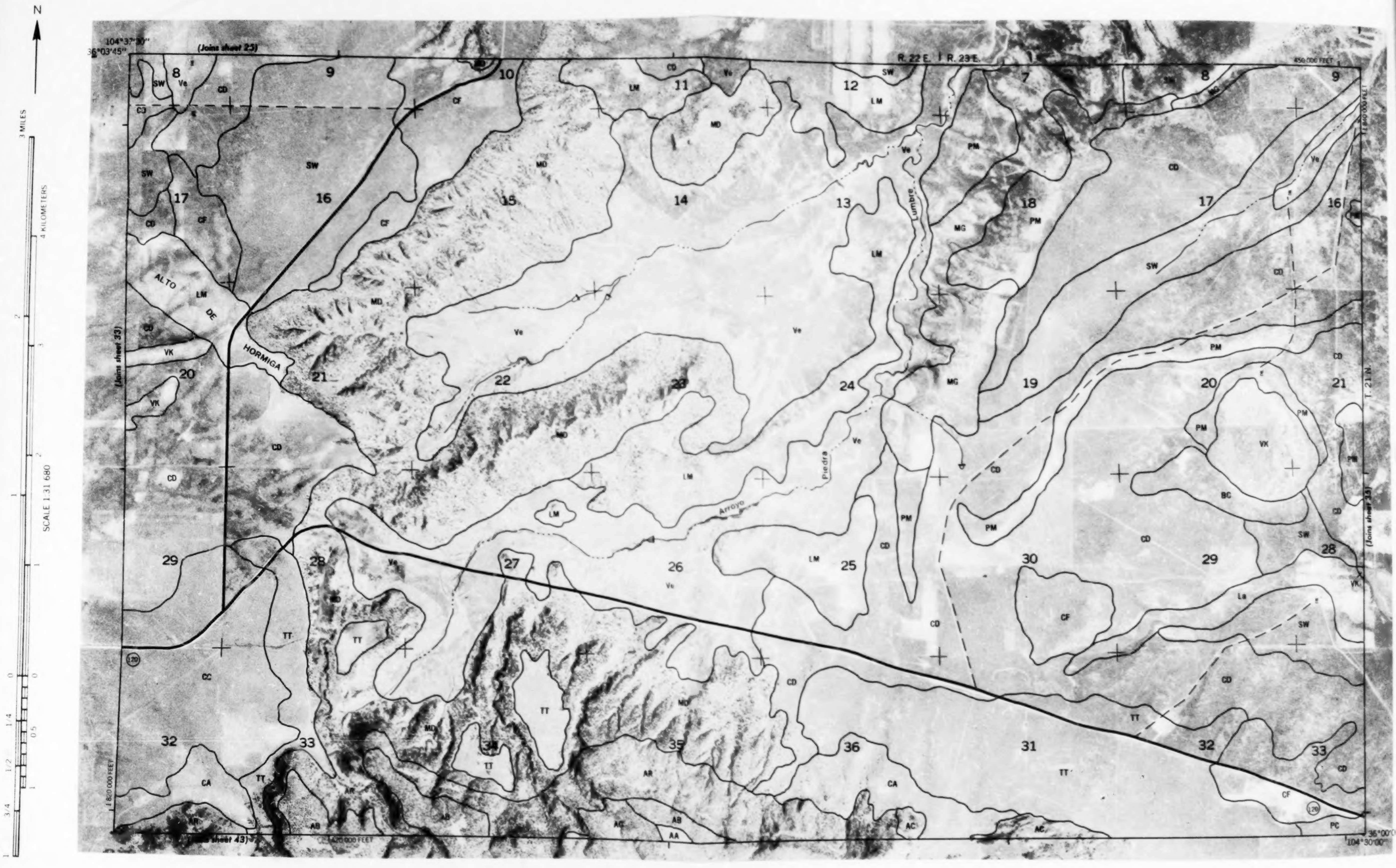
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating [illegible] from 1961 aerial photography. Coordinate grid ticks and land division corners, if [illegible]

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 33

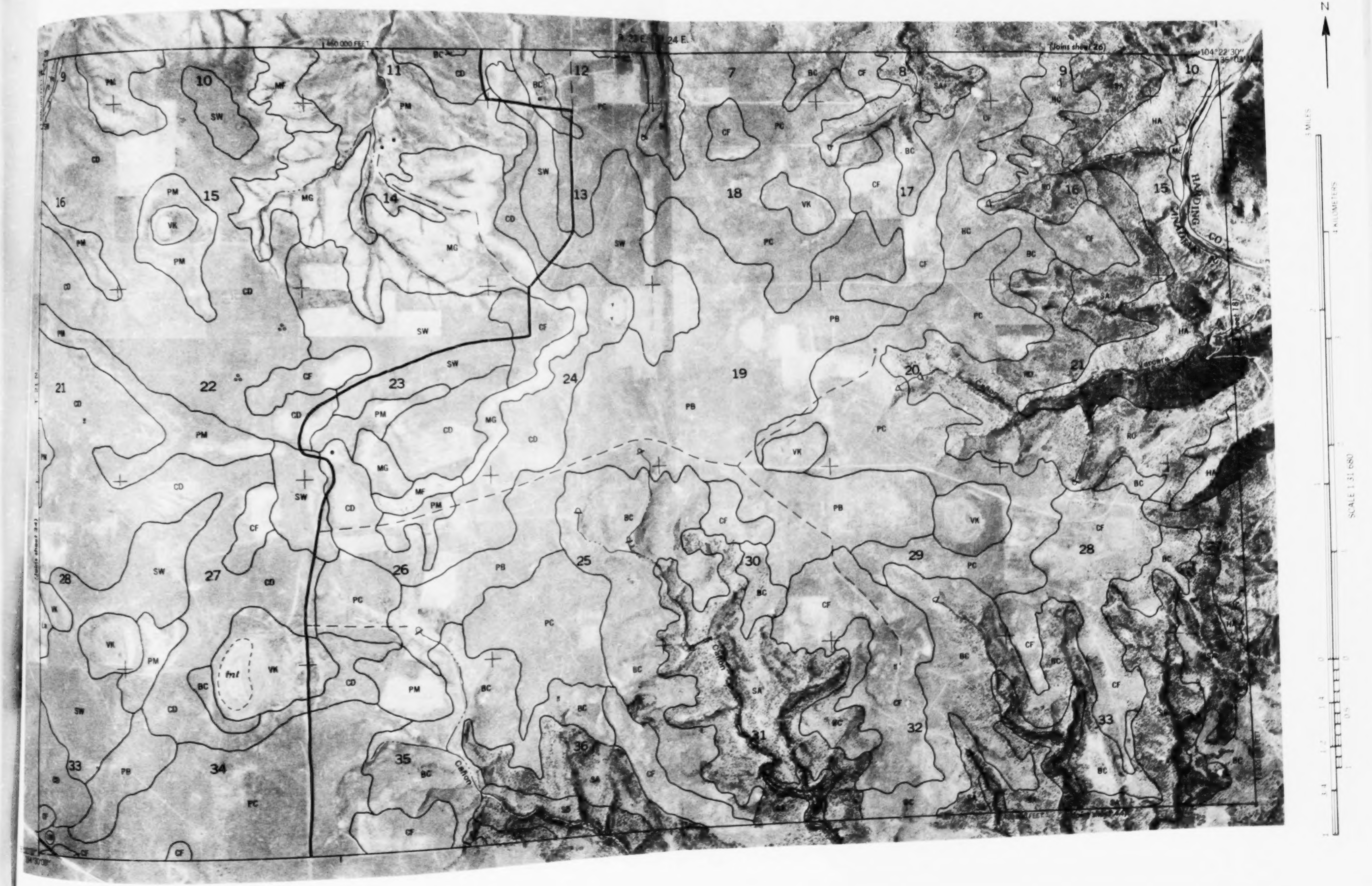

N
380 000 FEET
(Joins sheet 24)
R. 21 E. | R. 22 E.
104°37'30"
36°03'45"
(Joins sheet 34)
(Joins sheet 32)
(Joins sheet 42)
410 000 FEET
1 400 000 FEET
3 MILES
4 KILOMETERS
SCALE 1:31 680
MORA
GRANT
GRANT BOUNDARY
MORA
Apache Hill
Santa Clara Spring
Coral Spring
Dead Cottonwood Spring
Big Willow Spring
Big Spring
South Spring
STATE GAME MANAGEMENT AREA
intermittent
SANTA FE TRAIL
ATCHISON TOPEKA AND SANTA FE
WAGON MOUND CUT-OFF
WAGON MOUND
SANTA CLARA MESA
LAS MESAS DEL CONJELON
85
25
120
271
8
9
10
11
12
7
17
16
15
13
14
18
20
21
22
23
24
19
27
26
25
30
29
28
34
33
32
35
36
31
CA
CC
AA
AC
AB
AR
PT
TT
VK
Ve
Ce
SW
CD
LM
ME
Lo
Int

34

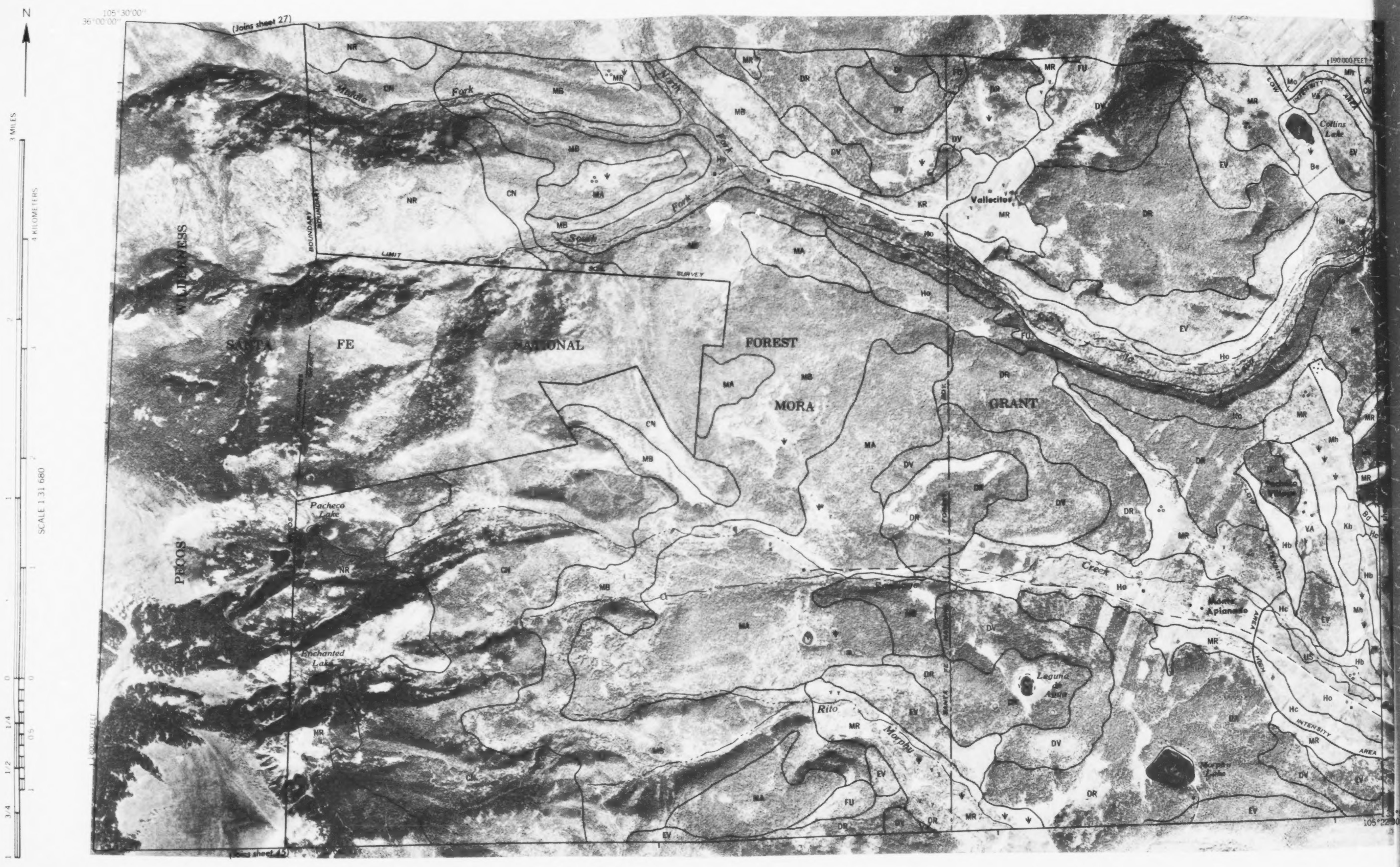
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 34


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
104°37'30"
36°03'45"
(Joins sheet 23)
(Joins sheet 33)
(Joins sheet 35)
(Joins sheet 43)
R. 22 E. | R. 23 E.
T. 21 N.
450 000 FEET
1 850 000 FEET
1 820 000 FEET
420 000 FEET
36°00'00"
104°30'00"
ALTO DE HORMIGA
Arroyo Piedra
Lumbre
120
8 9 10 11 12 7 8 9
17 16 15 14 13 18 17 16
20 21 22 23 24 19 20 21
29 28 27 26 25 30 29 28
32 33 34 35 36 31 32 33
SW Ve CD CF LM MD MG PM VK CC TT CA AR AB AC AA BC La PC

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 35

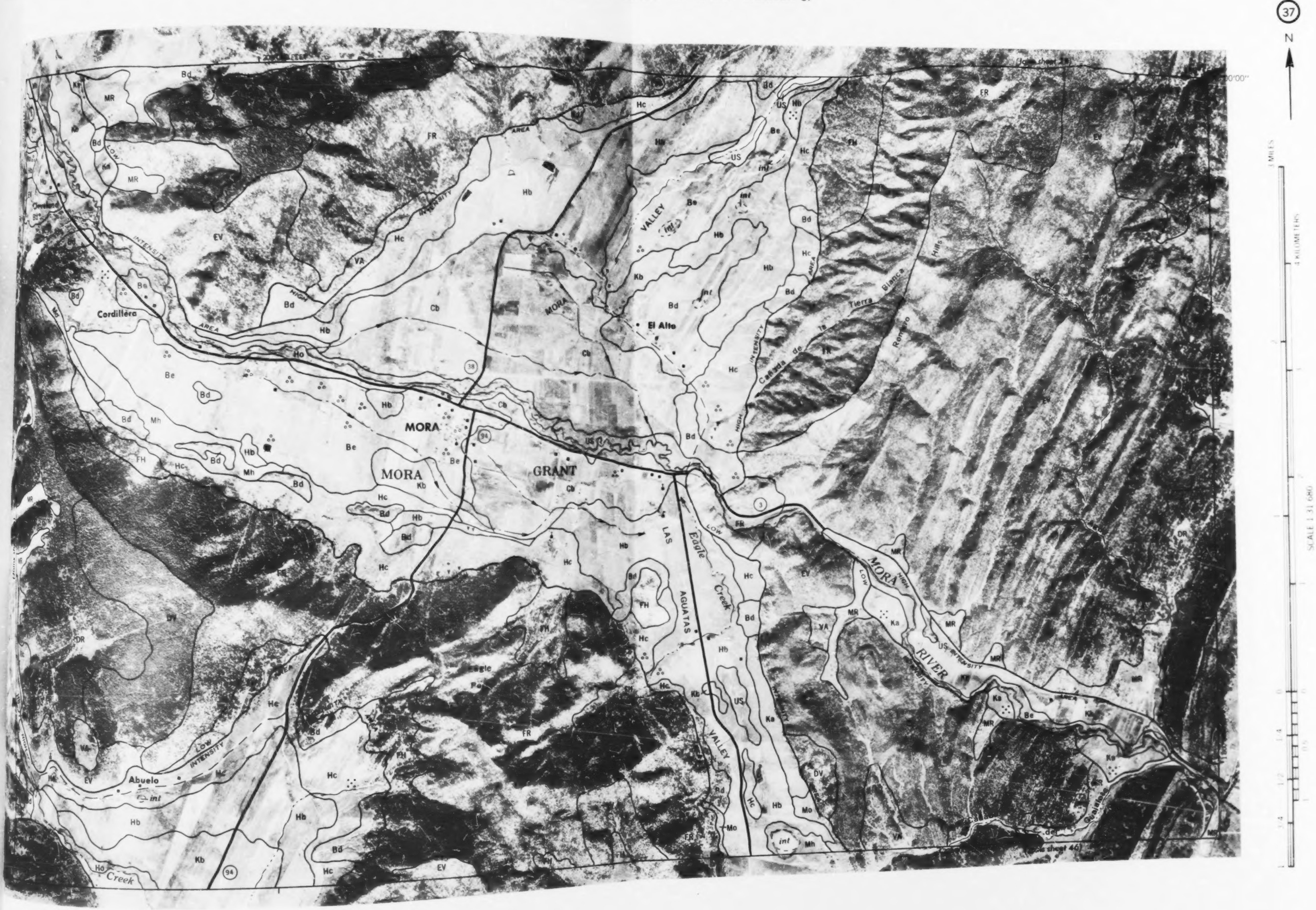

N
(Joins sheet 26)
104°22'30"
35°03'
R. 23 E.
R. 24 E.
1 140 000 FEET
HARDING CO
Cañon
SCALE 1:31 680
MILES
KILOMETERS
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36
BC
CD
CF
HA
MG
MF
PB
PC
PM
RO
SA
SW
VK

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 36

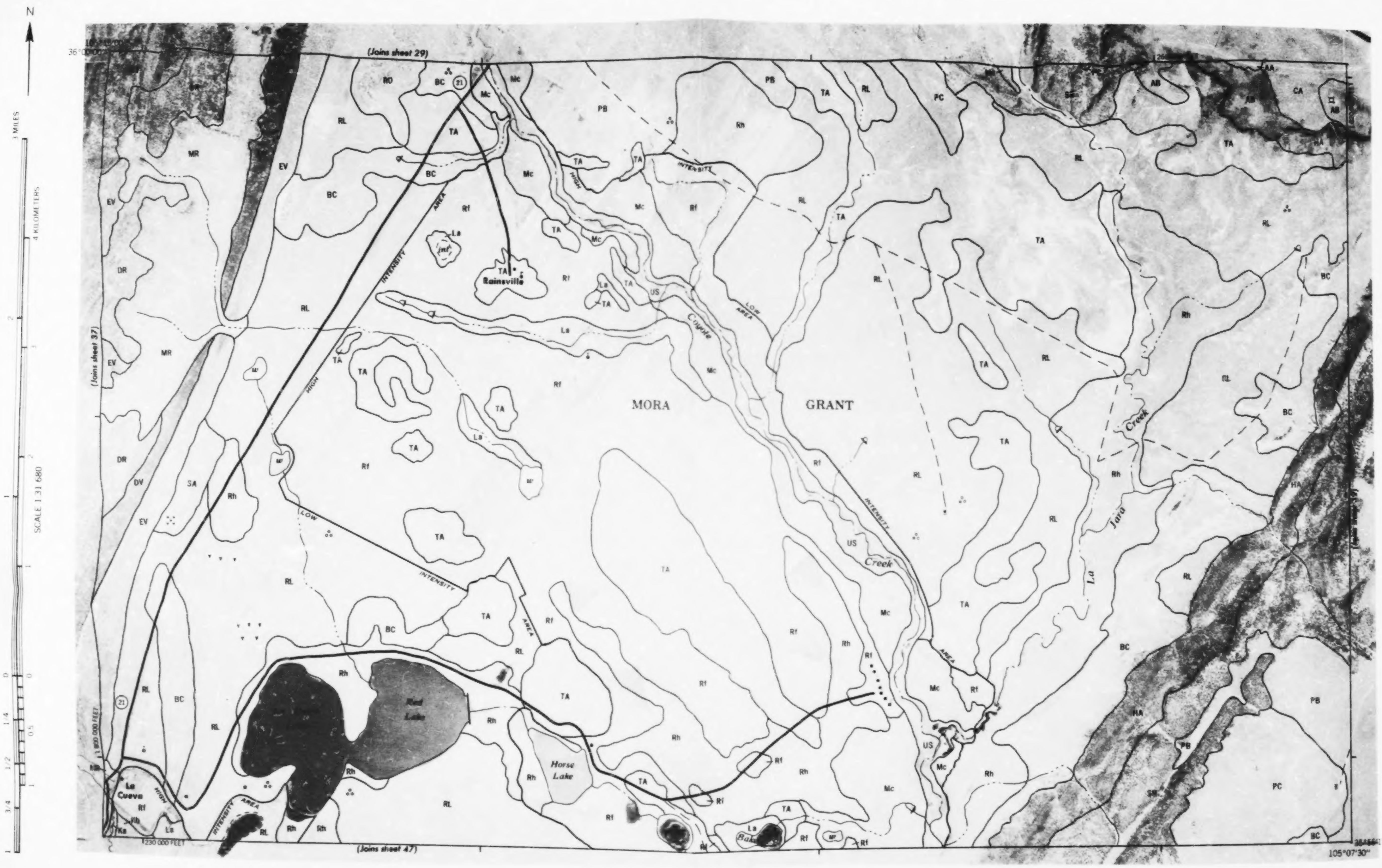

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
3
105°30'00"
36°00'00"
(Joins sheet 27)
(Joins sheet 45)
190 000 FEET
105°22'30"
WILDERNESS
SANTA
FE
NATIONAL
FOREST
PECOS
MORA
GRANT
BOUNDARY
LIMIT
SURVEY
Middle
Fork
North
Fork
South
Fork
Vallecitos
Collins Lake
LOW INTENSITY AREA
HIGH INTENSITY AREA
Pacheco Lake
Enchanted Lake
Creek
Rito
Morphy
Laguna de Agua
Morphy Lake
Monte Aplanado
Pacheco Village
NR
CN
MB
MA
MR
DR
DV
FU
KR
Ho
EV
Be
Mo
Va
VA
Kb
Hb
Hc
Mh
US

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating

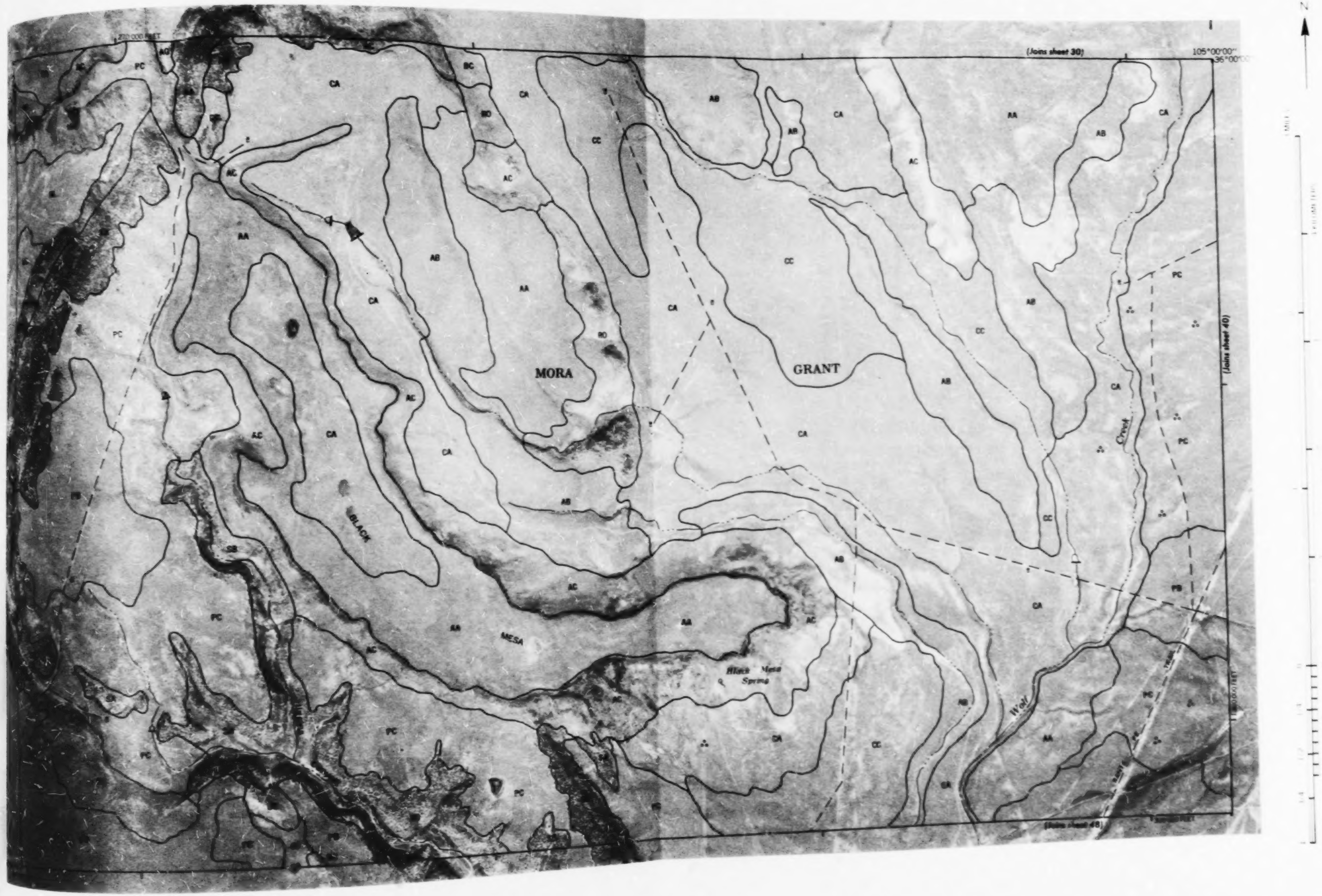
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 37


37
N
MORA
MORA GRANT
El Alto
Cordillera
Abuelo
MORA VALLEY
LAS AGUATAS VALLEY
Eagle Creek
MORA RIVER
Cañada de la Tierra Blanca
Romero Hills
Creek
LOW INTENSITY AREA
HIGH INTENSITY AREA
(Joins sheet 46)
38
94
3
Bd
Be
Cb
DR
DV
EV
FH
FR
Hb
Hc
Ho
Ka
Kb
Mh
Mo
MR
US
VA
int
SCALE 1:31 680
3 MILES
4 KILOMETERS
0
1/4
1/2
3/4
1
2

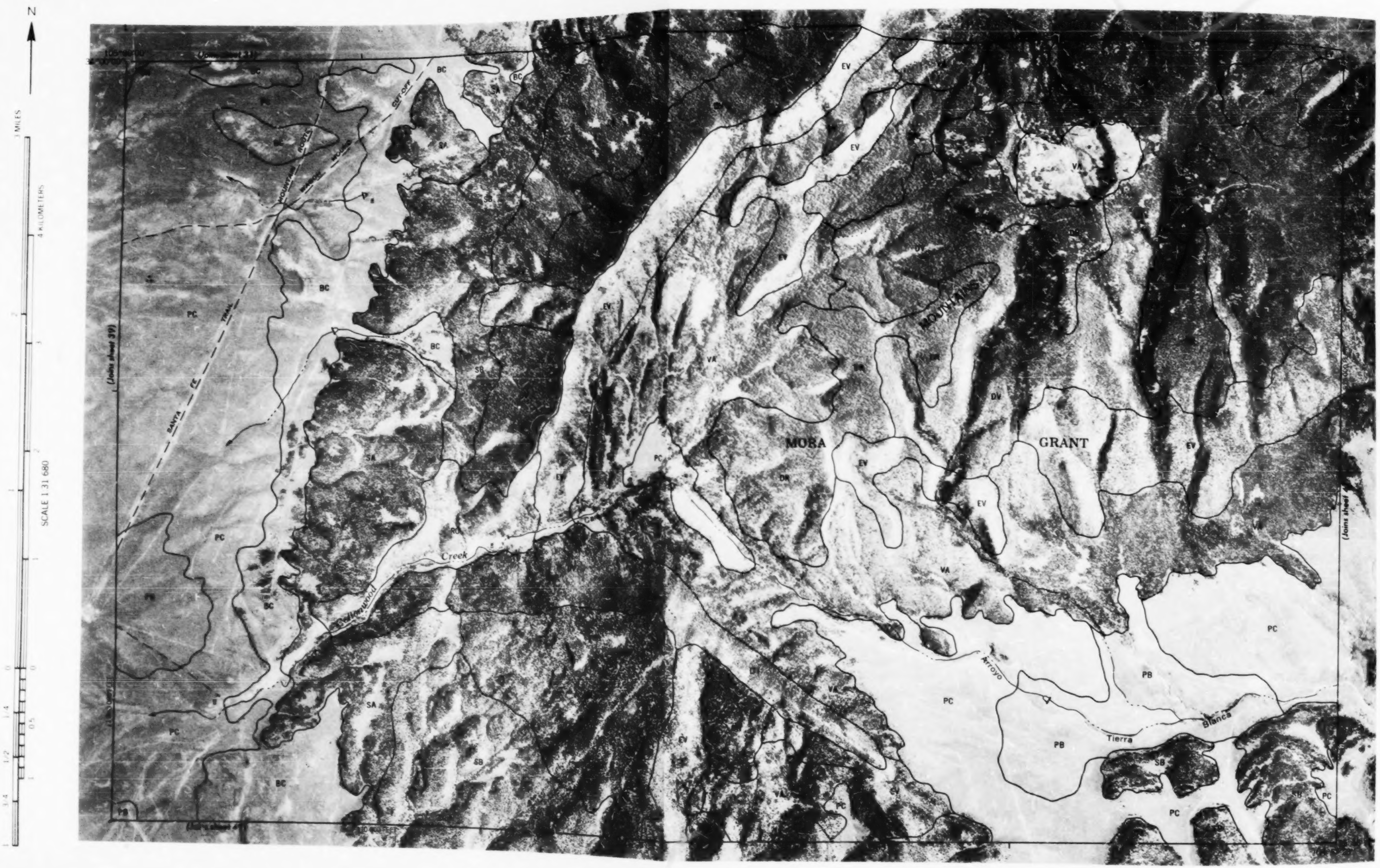
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 38


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
3
(Joins sheet 29)
(Joins sheet 37)
(Joins sheet 47)
36°00'00"
105°07'30"
1 800 000 FEET
230 000 FEET
MORA
GRANT
Rainsville
La Cueva
Red Lake
Horse Lake
Coyote Creek
La Jara Creek
HIGH INTENSITY AREA
LOW INTENSITY AREA
21
RL
TA
BC
Mc
PB
Rh
Rf
La
MR
EV
DR
DV
SA
US
PC
AB
CA
HA
SR
Ls
Ka
Rb

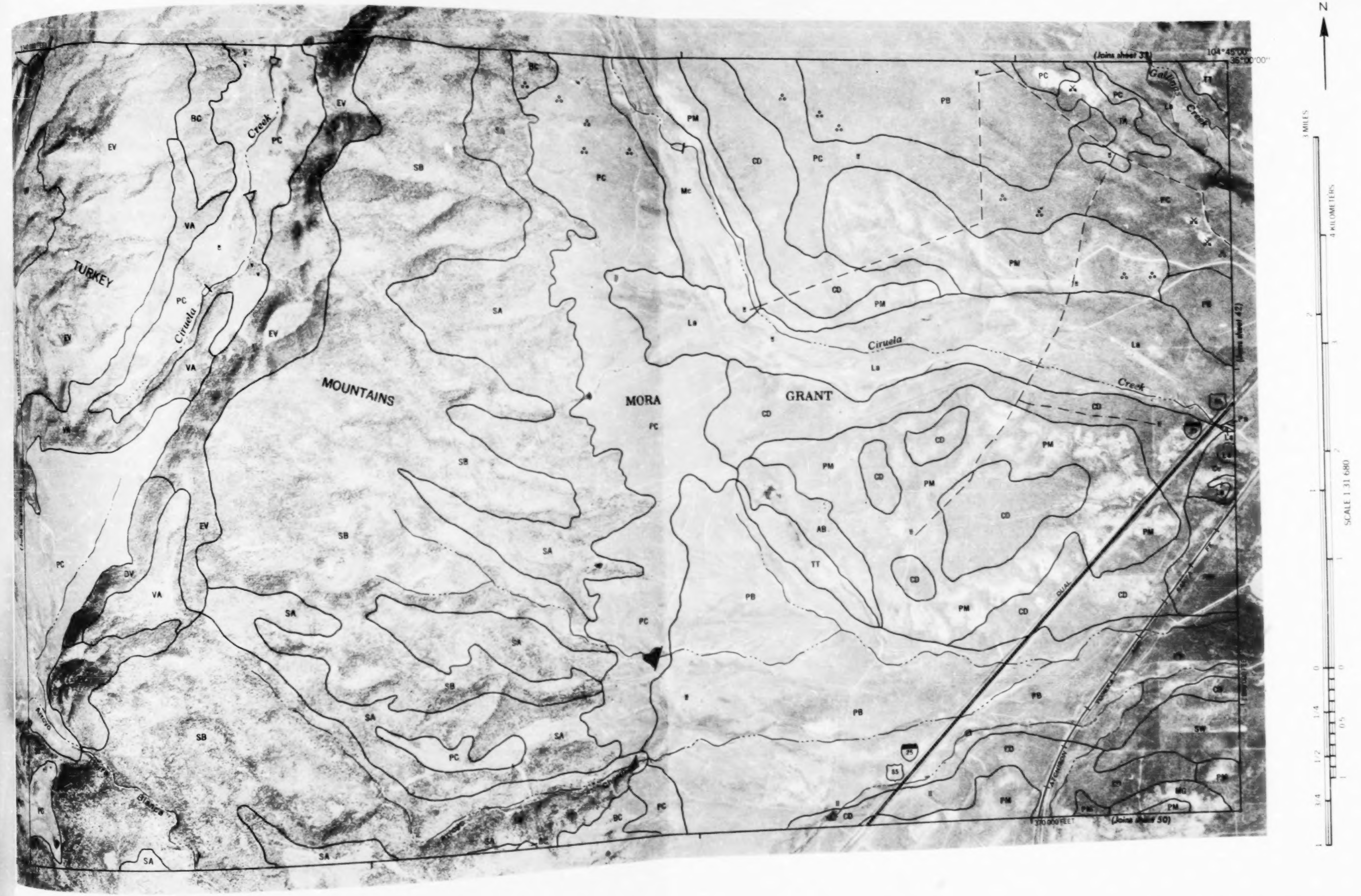
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation [illegible]

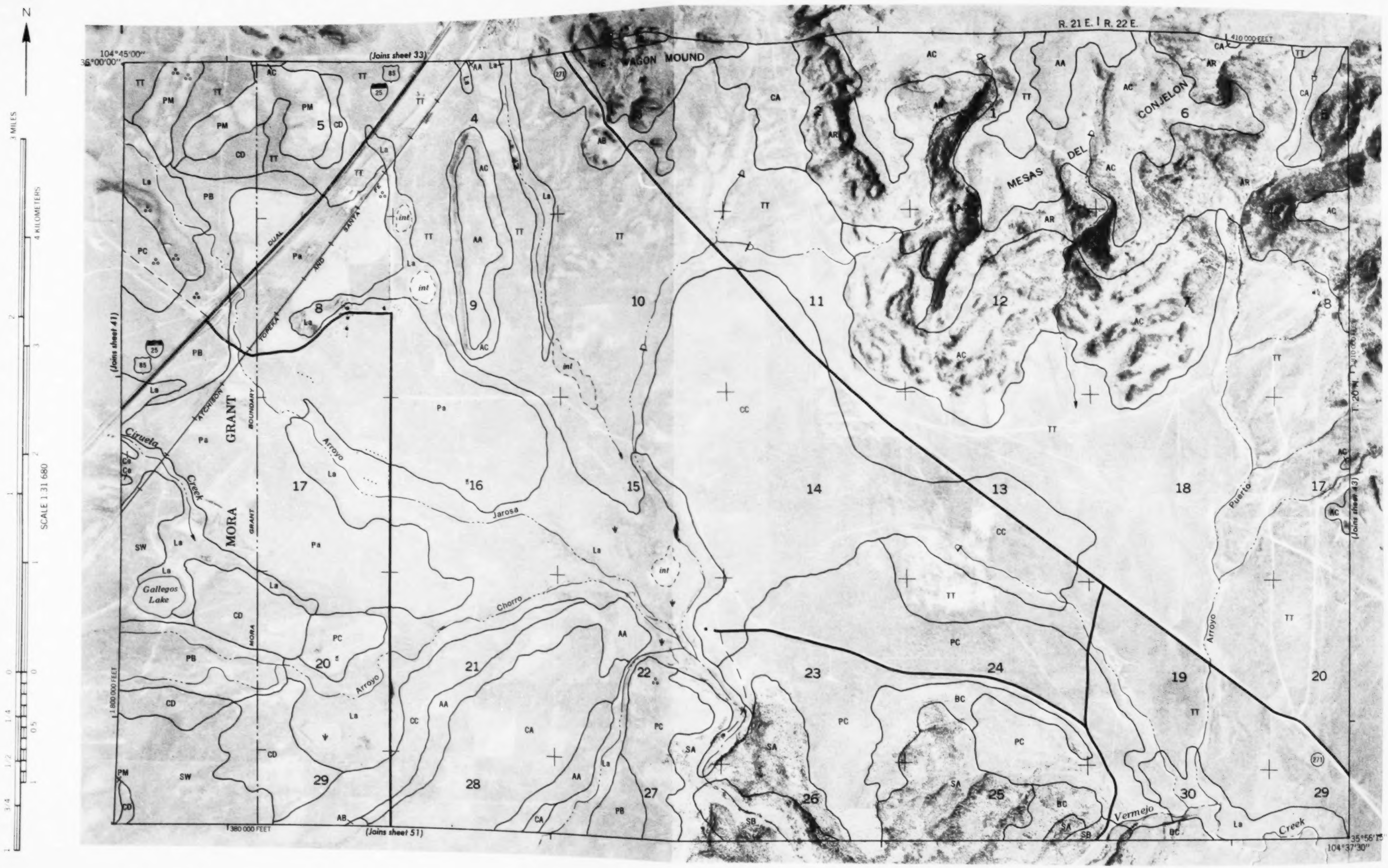

N
270 000 FEET
(Joins sheet 30)
105°00'00"
36°00'00"
(Joins sheet 40)
(Joins sheet 48)
MORA
GRANT
BLACK
MESA
Black Mesa Spring
Wolf
Creek
AA
AB
AC
BC
BO
CA
CC
PB
PC
RO
SB

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 40

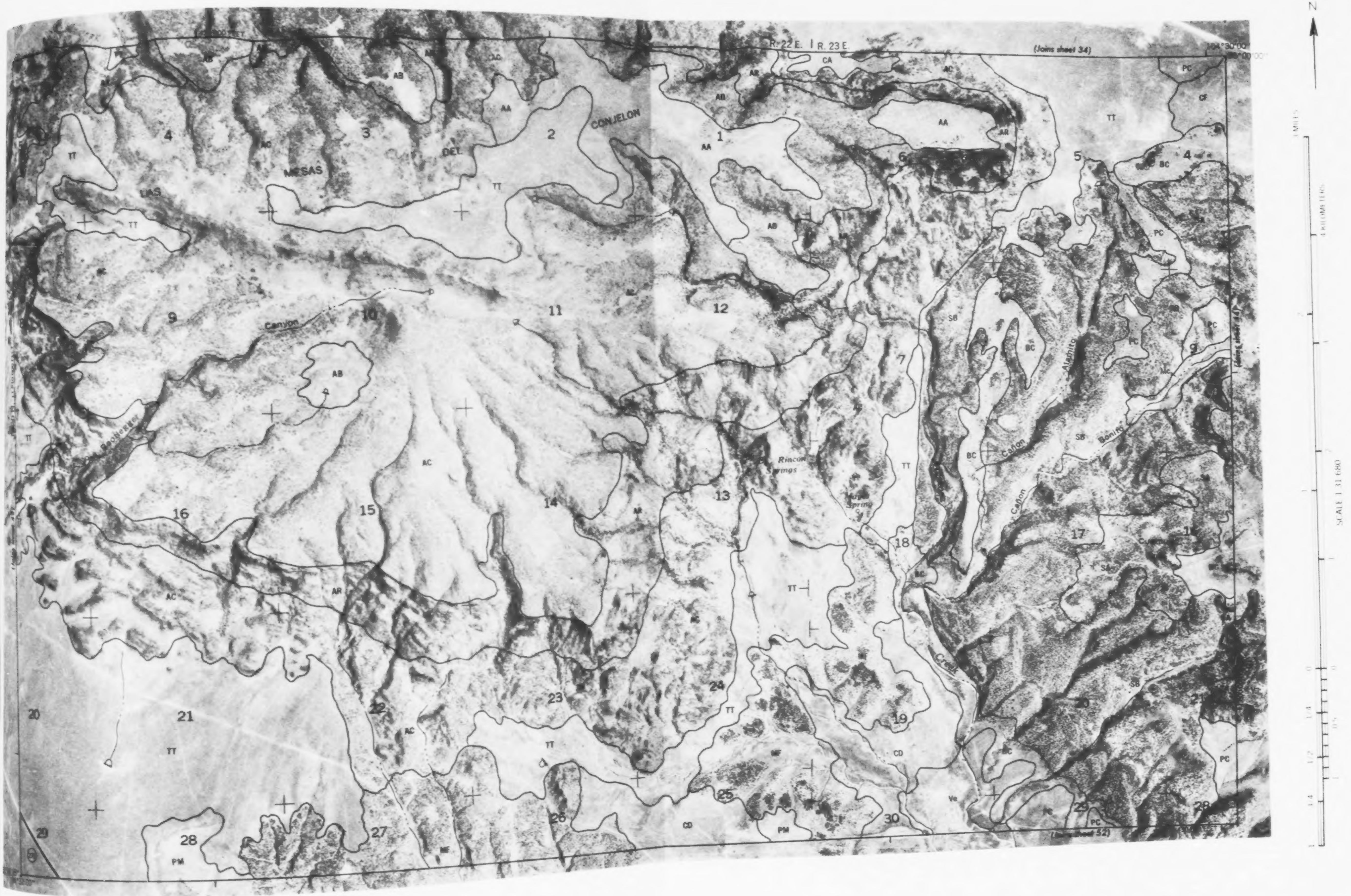

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
(Joins sheet 33)
(Joins sheet 39)
(Joins sheet 41)
SANTA FE TRAIL
MOUNTAIN ROUTE
CUT-OFF
BC
PC
PB
SA
SB
EV
VA
DV
DR
MOUNTAINS
MORA
GRANT
Cottonwood
Creek
Arroyo
Tierra
Blanca

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base [illegible] from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

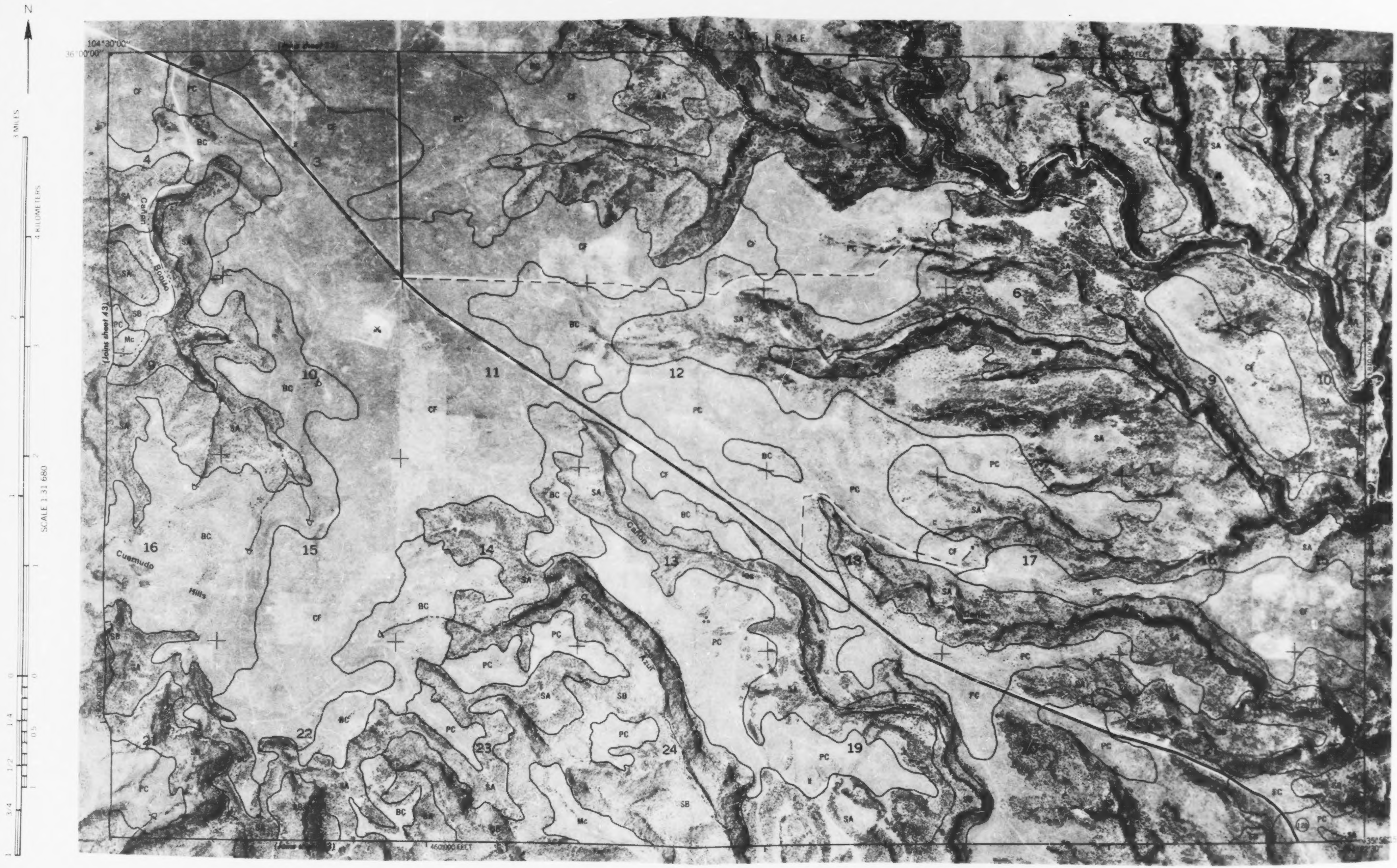

(Joins sheet 33)
104°45'00"
35°00'00"
N
3 MILES
4 KILOMETERS
SCALE 1:31 680
(Joins sheet 42)
(Joins sheet 50)
370 000 FEET
TURKEY
MOUNTAINS
MORA
GRANT
Ciruela
Creek
Gallinas
Creek
EV
BC
PC
VA
SB
SA
DV
PM
Mc
CD
PB
La
TA
TT
AB
SW
MG
85
25
DUAL


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
104°45'00"
36°00'00"
(Joins sheet 33)
(Joins sheet 41)
(Joins sheet 43)
(Joins sheet 51)
R. 21 E. | R. 22 E.
410 000 FEET
1 800 000 FEET
380 000 FEET
T. 20 N.
35°56'15"
104°37'30"
WAGON MOUND
MESAS DEL CONJELON
MORA GRANT
GRANT BOUNDARY
ATCHISON TOPEKA AND SANTA FE
DUAL
Ciruela Creek
Gallegos Lake
Arroyo Jarosa
Chorro
Arroyo
Puerto
Arroyo
Vermejo Creek
25
85
271
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
TT
PM
CD
PB
PC
La
Pa
AC
AA
AR
AB
CA
CC
SW
Ce
int
BC
SA
SB
DC

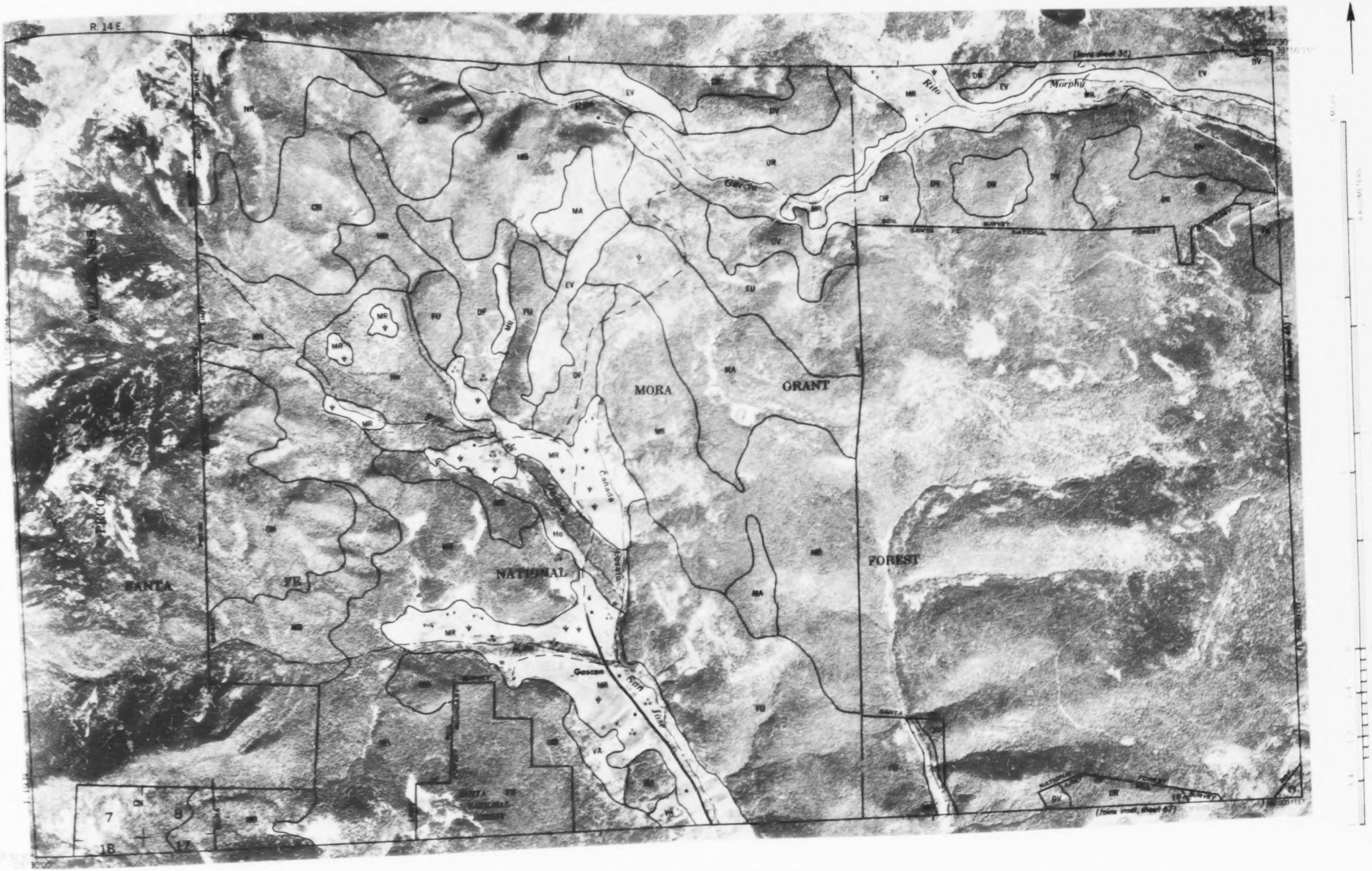
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


R. 22 E.
R. 23 E.
(Joins sheet 34)
104°30'00"
LAS
MESAS
DEL
CONJELON
Canyon
Rincon Springs
Spring
Alamito
Cañon
Bonito
Creek
(Joins sheet 52)
AA
AB
AC
AR
CA
BC
PC
CF
TT
SB
CD
MF
PM
Va
1
2
3
4
5
6
7
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
N
3 MILES
4 KILOMETERS
SCALE 1:31 680

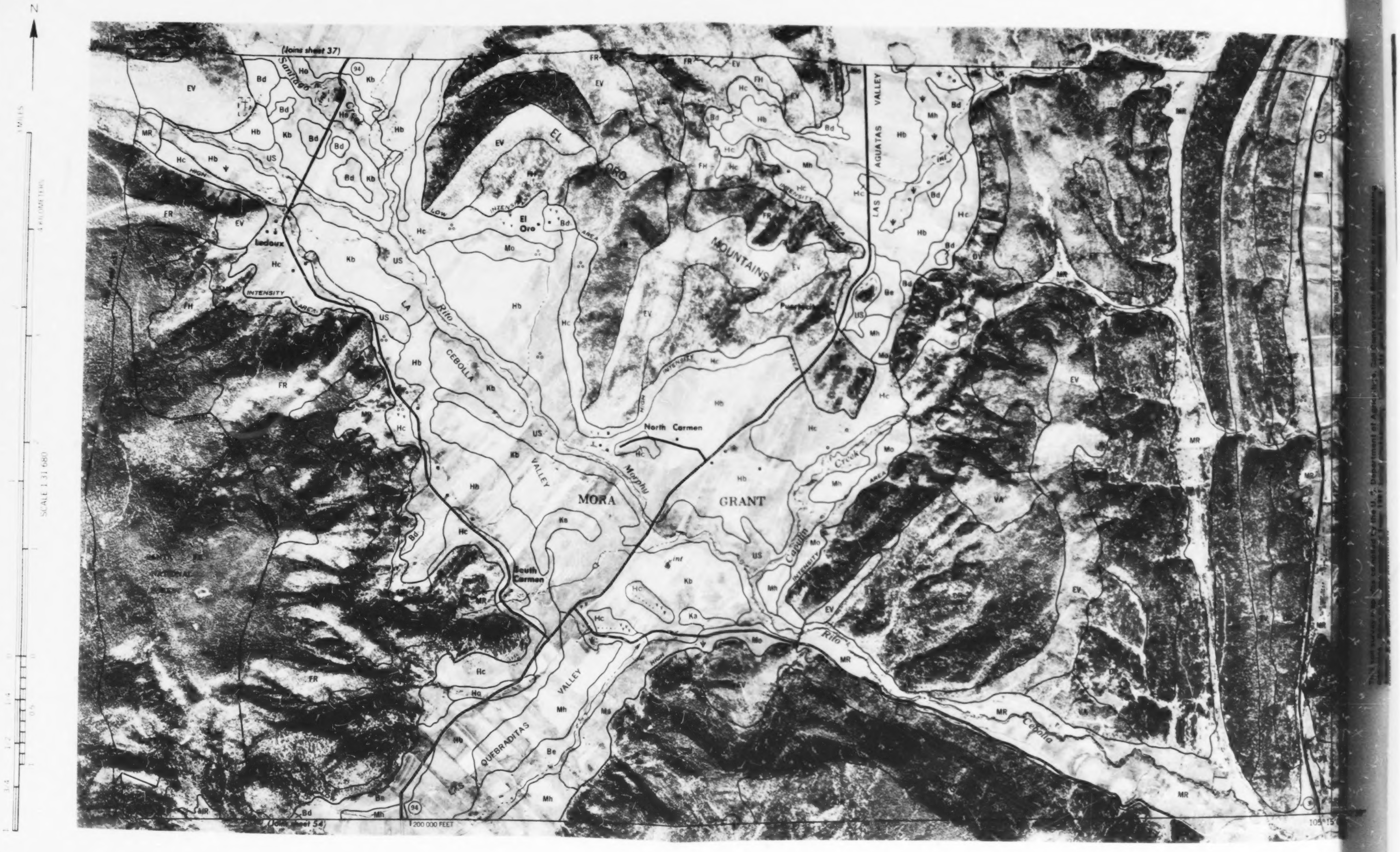
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 44

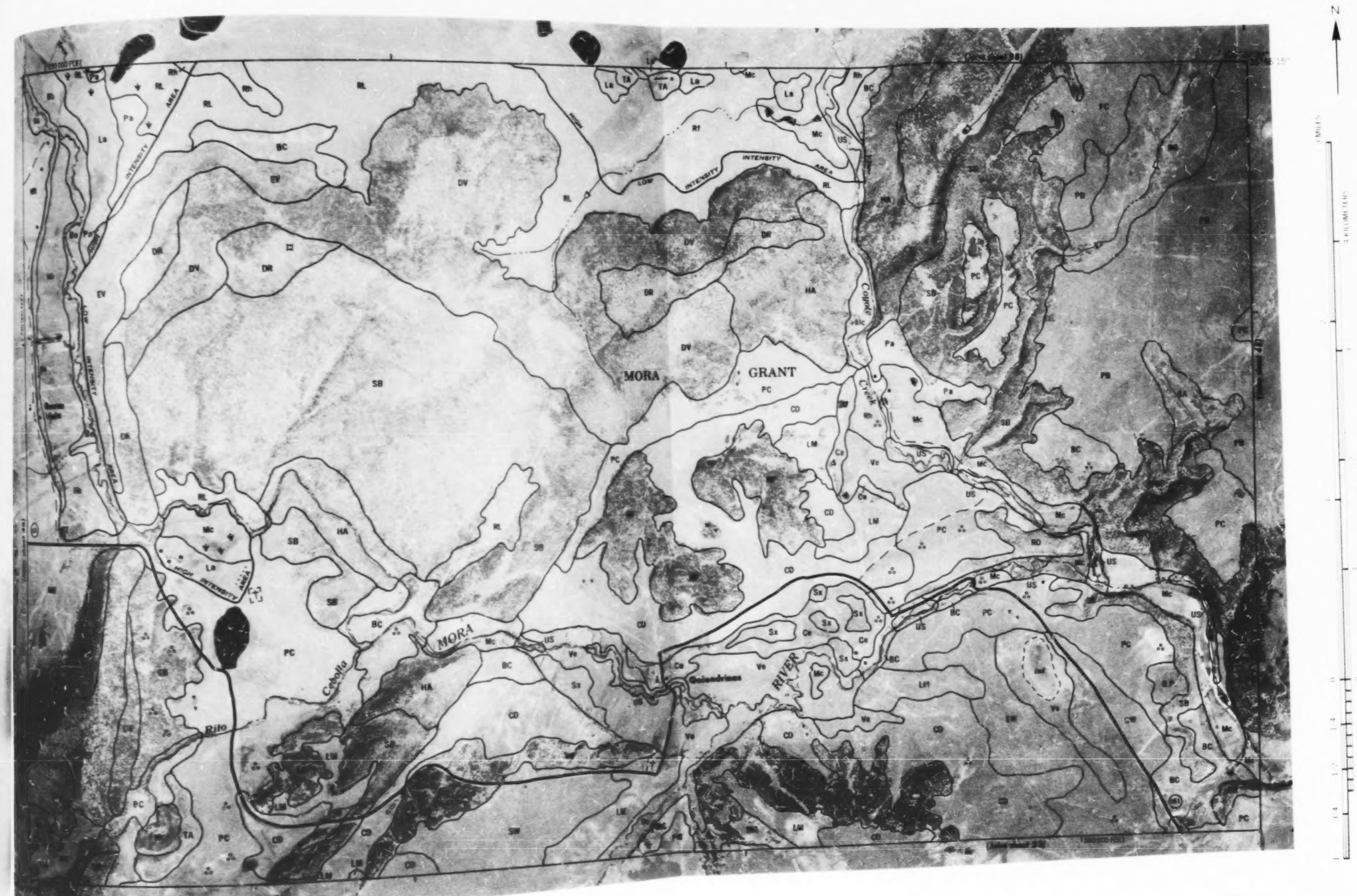

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
104°30'00"
36°00'00"
(Joins sheet 39)
R. 23 E. | R. 24 E.
(Joins sheet 43)
(Joins sheet 49)
460 000 FEET
35°52'30"
Cañon Bonito
Cuemudo Hills
Cañon
Cañon Azul
CF
PC
BC
SA
SB
Mc
1
2
3
4
6
9
10
11
12
13
14
15
16
17
18
19
22
23
24

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base [illegible] from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
R. 14 E.
(Joins sheet 36)
Rito
Morphy
Garcia
MORA
GRANT
SANTA
FE
NATIONAL
FOREST
PECOS
WILDERNESS
Canada
Gascon
SANTA FE NATIONAL FOREST
NR
MR
EV
DV
DR
MA
FU
DF
Ho
7
8
18
17

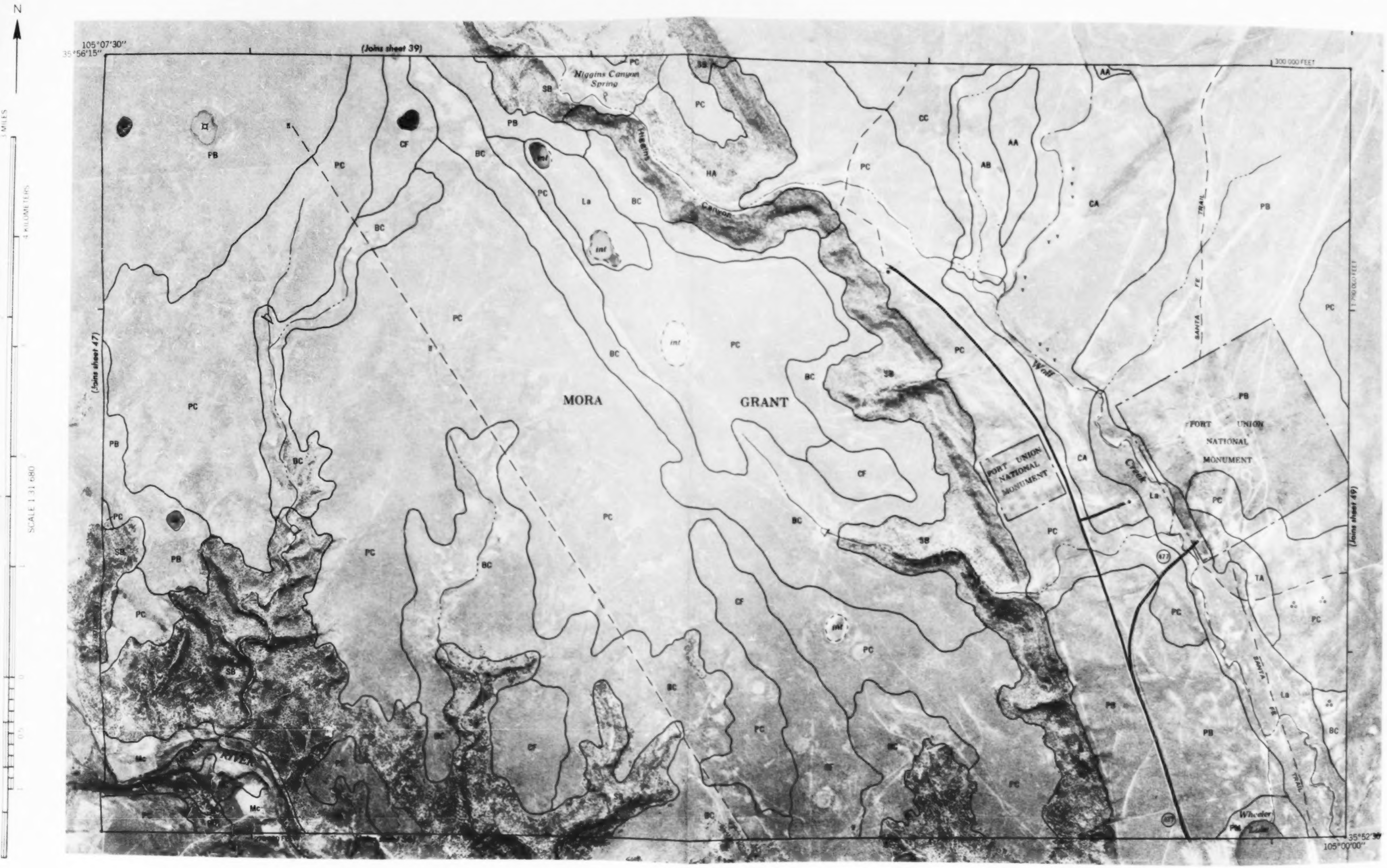
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 46


N
MILES
KILOMETERS
SCALE 1:31 680
(Joins sheet 37)
(Joins sheet 54)
200 000 FEET
105°15'
94
EL ORO MOUNTAINS
LAS AGUATAS VALLEY
LA CEBOLLA VALLEY
MORA GRANT
LAS QUEBRADITAS VALLEY
Ledoux
El Oro
Puertecito
North Carmen
South Carmen
Santiago Creek
Rito Cebolla
Rito Morphy
Capulin Creek
Cebolla
Rito
HIGH INTENSITY AREA
LOW INTENSITY AREA
EV
Bd
Hb
Hc
Kb
Ka
US
MR
FR
FH
Mh
Mo
Be
VA
int
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies.

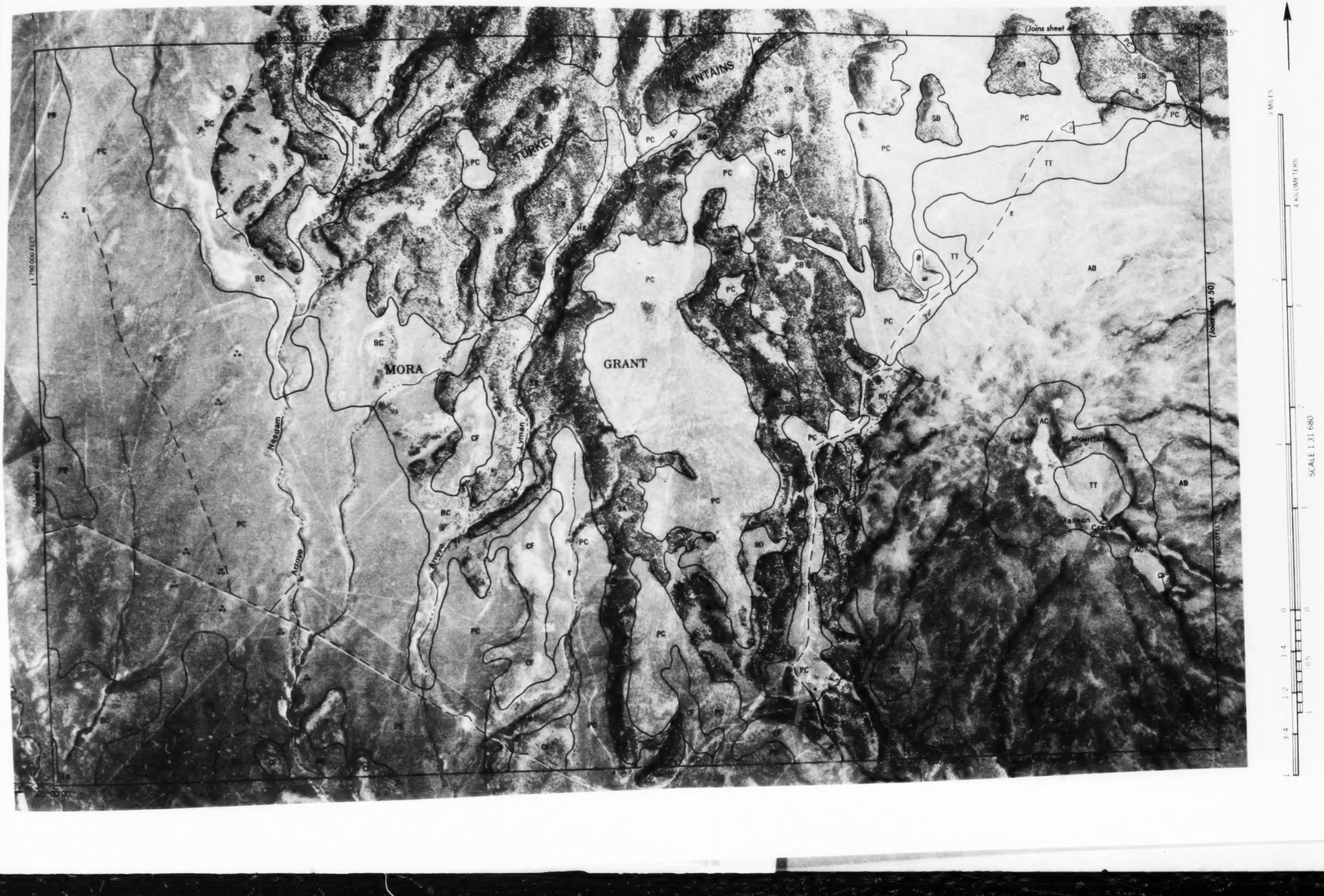

N
MORA
GRANT
Coyote
Creek
MORA
RIVER
Cebolla
Rito
Golondrinas
HIGH INTENSITY AREA
LOW INTENSITY AREA
SB
DV
DR
EV
BC
RL
La
Pa
HA
PC
CD
LM
Mc
US
Ve
Sx
Co
PB
TA
3 MILES
4 KILOMETERS
SCALE 1:31 680

㊽

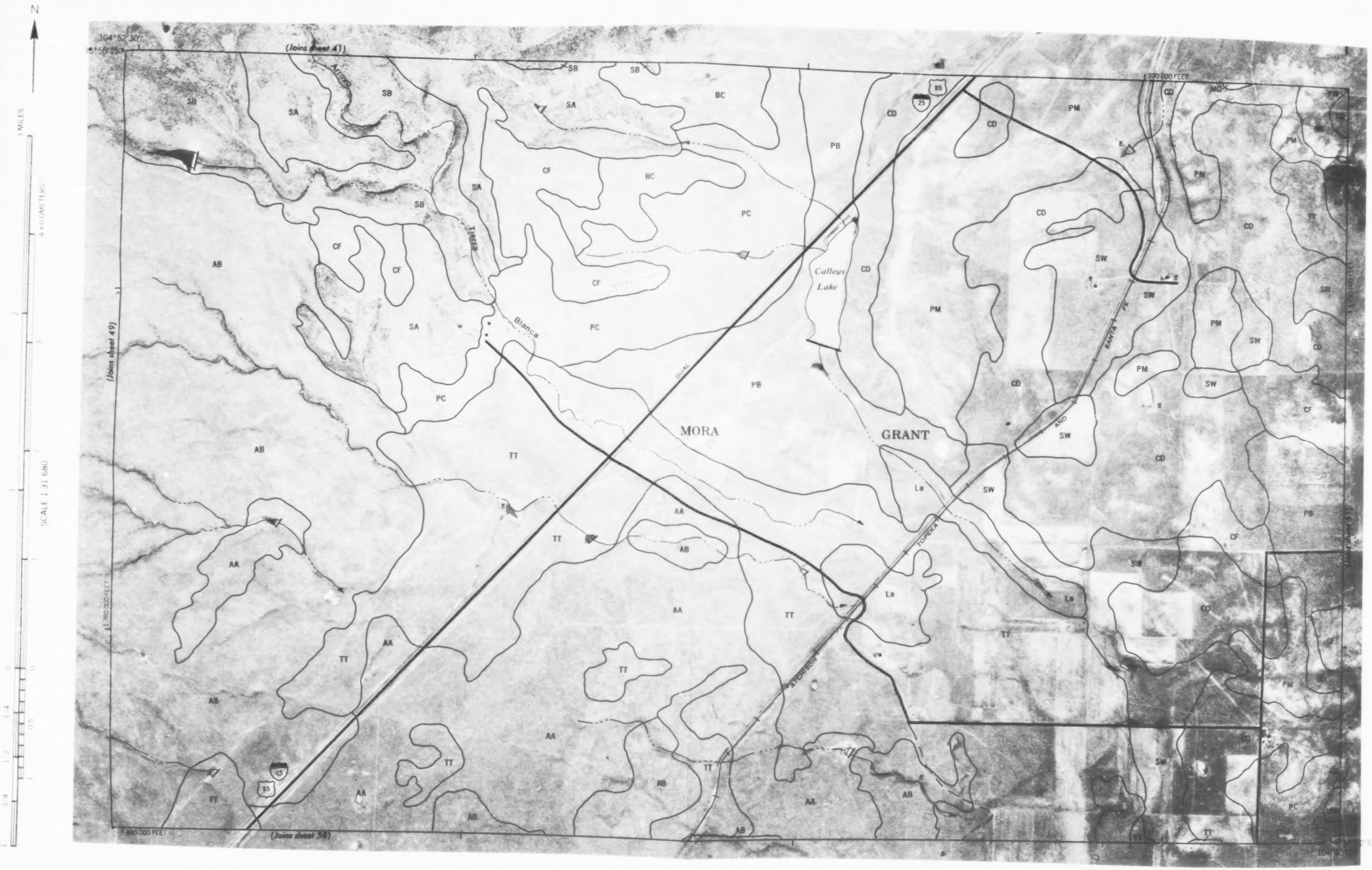
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 48


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°07'30"
35°56'15"
(Joins sheet 39)
(Joins sheet 47)
(Joins sheet 49)
300 000 FEET
1 790 000 FEET
35°52'30"
105°00'00"
Higgins Canyon Spring
Higgins Canyon
MORA
GRANT
FORT UNION NATIONAL MONUMENT
Wolf Creek
SANTA FE TRAIL
Wheeler Lake
RIVER
477
PC
PB
CF
BC
La
SB
HA
CC
AA
AB
CA
TA
Mc
inf

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

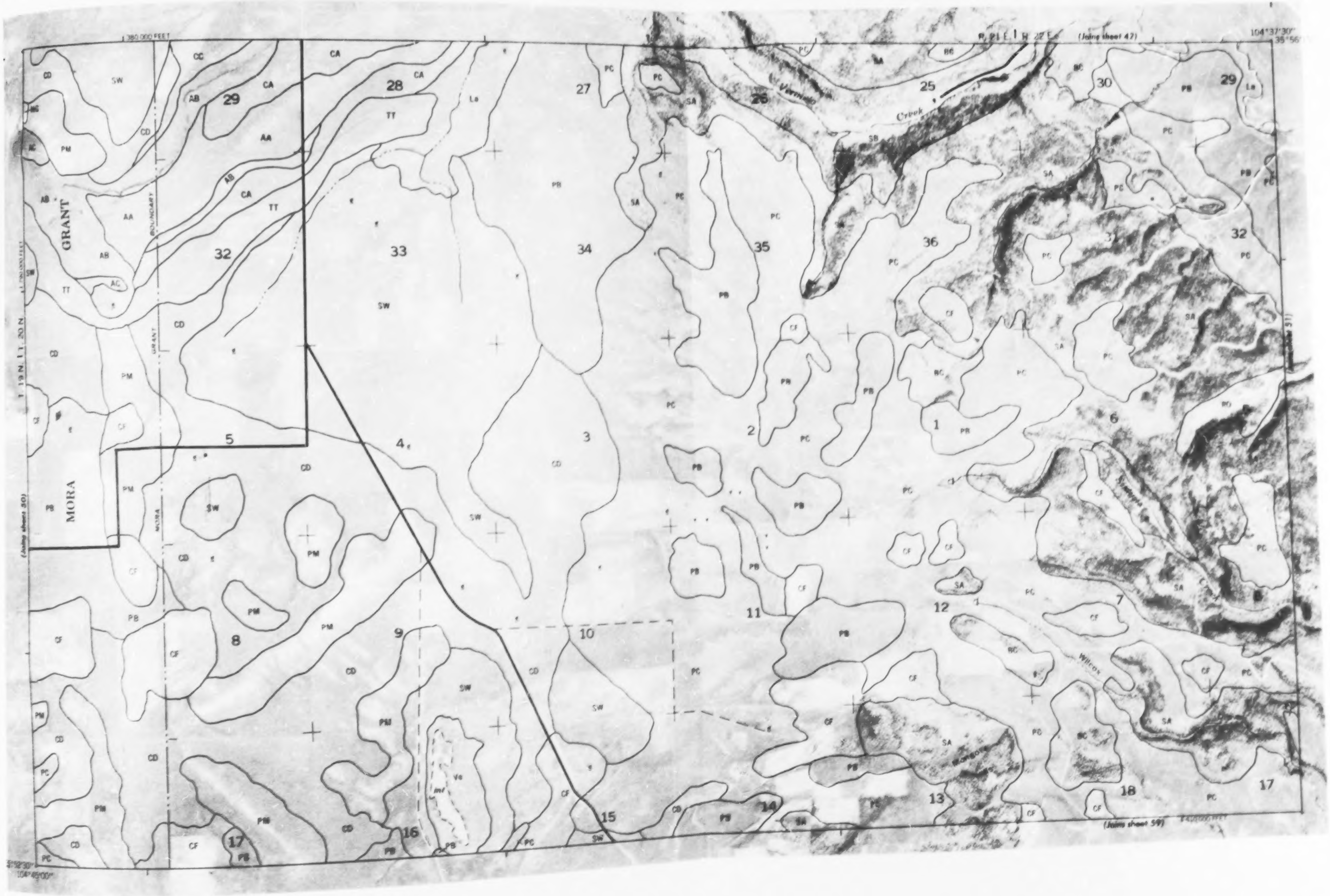

N
(Joins sheet 4
36°15'
1 750 000 FEET
(Joins sheet 48)
(Joins sheet 50)
1 790 000 FEET
104°30'00"
TURKEY
MOUNTAINS
MORA
GRANT
Needam
Arroyo
Lyman
Mountain
Cra
PC
PB
BC
SB
SA
HA
Mc
EV
TT
AB
AC
CF
BD
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
3

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 50

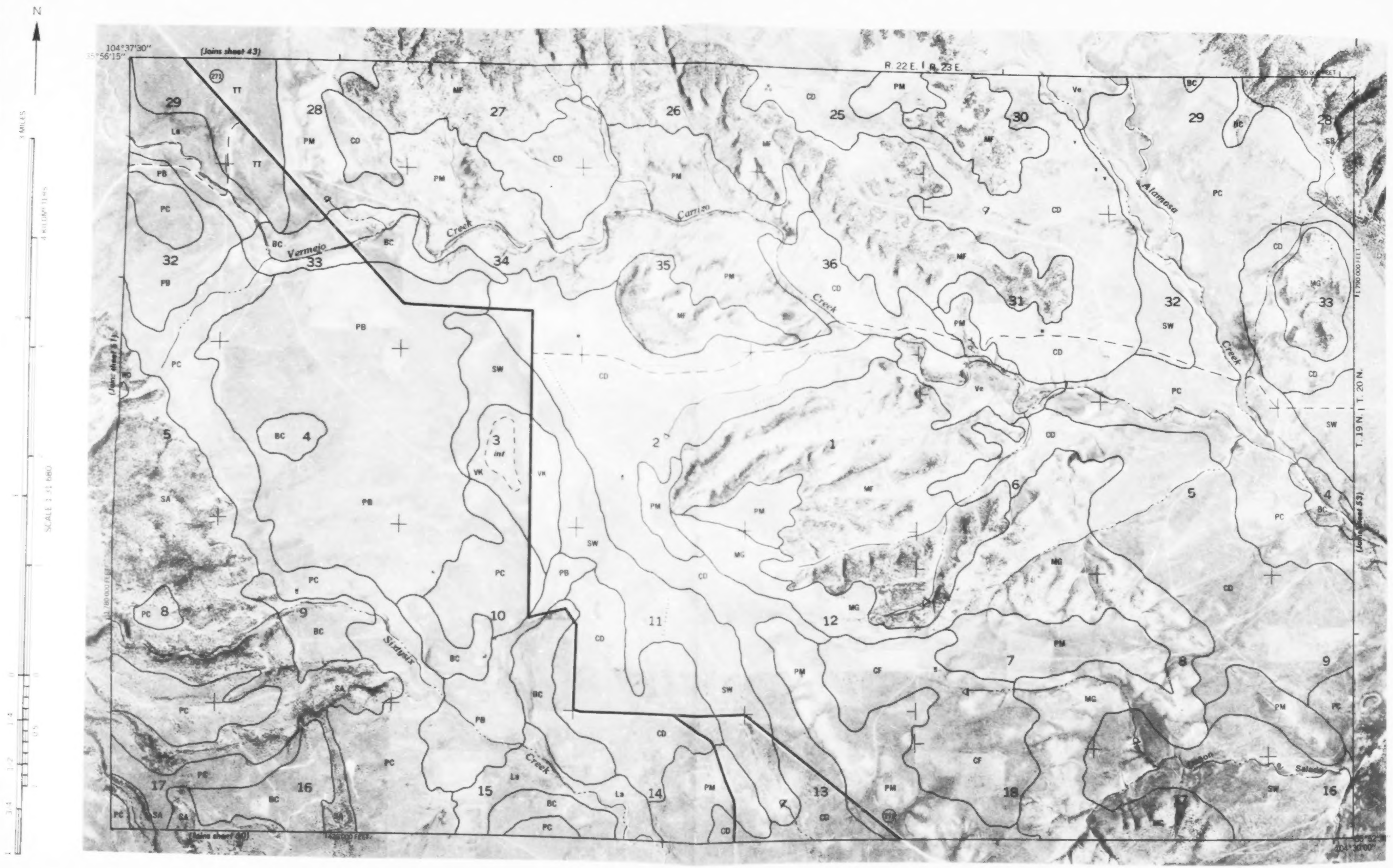

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
104°52'30"
35°56'15"
(Joins sheet 41)
(Joins sheet 49)
(Joins sheet 58)
(Joins sheet 51)
370 000 FEET
1 780 000 FEET
940 000 FEET
Arroyo
Tierra
Blanca
Calleus Lake
MORA
GRANT
DUAL
SANTA FE
AND
TOPEKA
ATCHISON
85
25
SB
SA
BC
CF
PC
PB
CD
PM
SW
AB
TT
AA
La
MO
PC

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 51

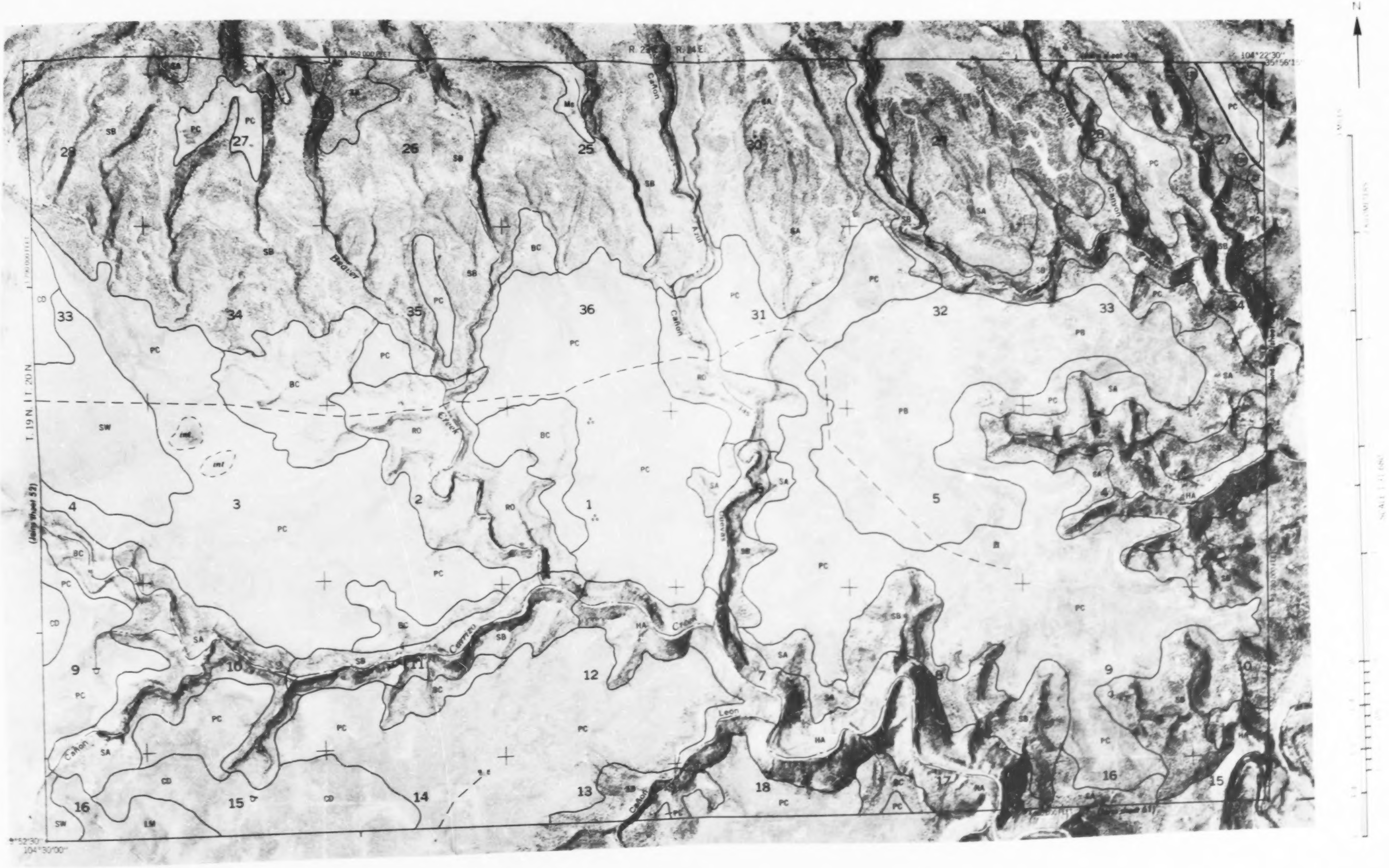

N
380 000 FEET
R 21 E | R 22 E
(Joins sheet 42)
104°37'30"
35°56'
(Joins sheet 50)
(Joins sheet 59)
440 000 FEET
35°52'30"
104°45'00"
T. 19 N. | T. 20 N.
GRANT
MORA
GRANT BOUNDARY
MORA
Vermejo Creek
Wilcox
28
29
32
33
34
35
36
27
26
25
30
29
32
5
4
3
2
1
6
7
8
9
10
11
12
13
14
15
16
17
17
18
CA
CC
CD
AB
AA
AC
TT
SW
PM
CF
PB
PC
SA
SB
BC
La
Va
mf

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 52

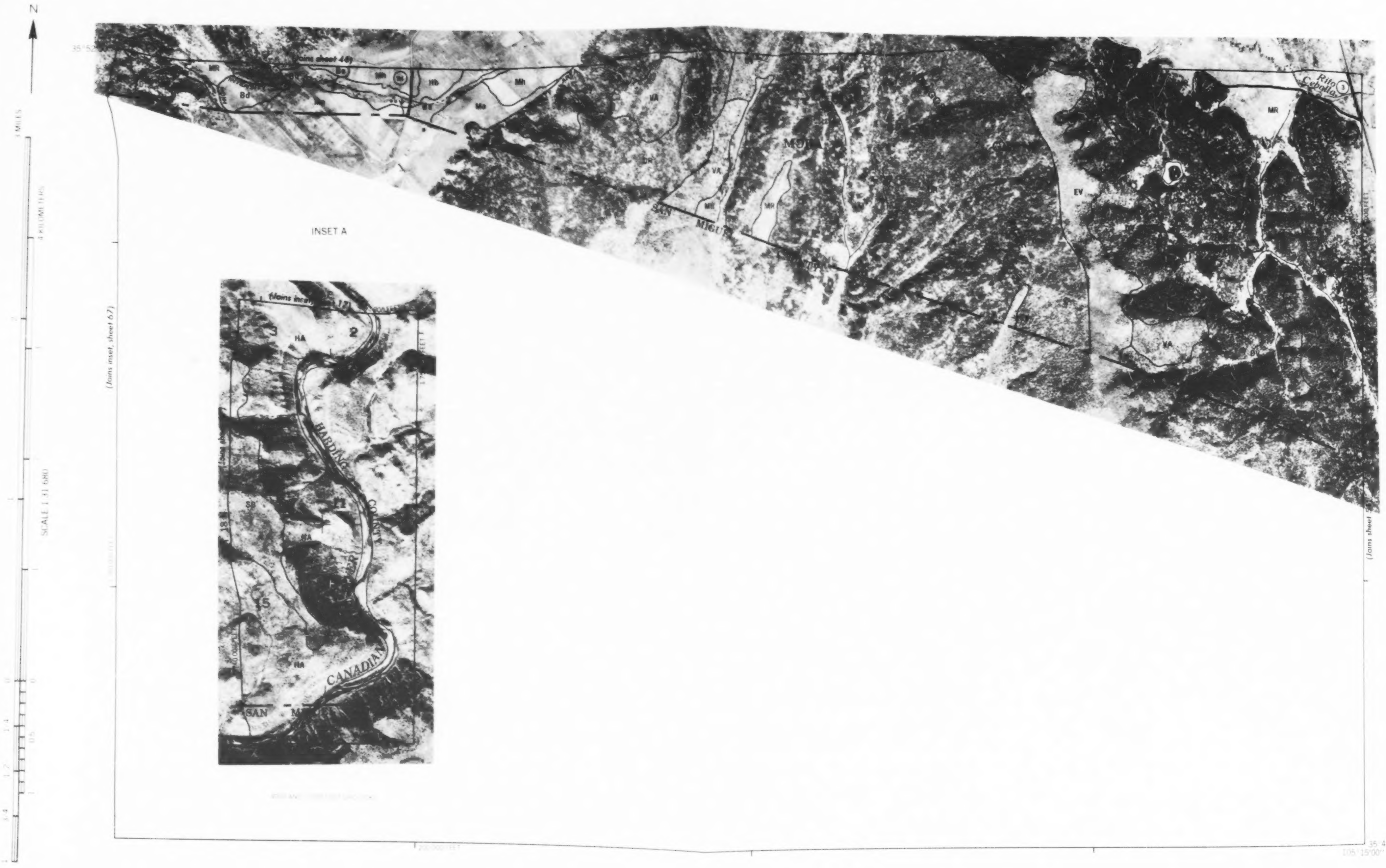

N
104°37'30"
35°56'15"
(Joins sheet 43)
271
R. 22 E. | R. 23 E.
(Joins sheet 51)
(Joins sheet 53)
(Joins sheet 60)
T. 19 N. | T. 20 N.
1 780 000 FEET
1 790 000 FEET
150 000 FEET
120 000 FEET
35°52'30"
104°30'00"
Vermejo Creek
Carrizo Creek
Alamosa Creek
Sixtynix Creek
Saladon
Salada
29 28 27 26 25 30 29 28
32 33 34 35 36 31 32 33
5 4 3 2 1 6 5 4
8 9 10 11 12 7 8 9
17 16 15 14 13 18 17 16
TT La PB PC BC PM CD MF Ve SB SW MG VK Lnf SA CF
1 MILES
4 KILOMETERS
SCALE 1:31 680

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

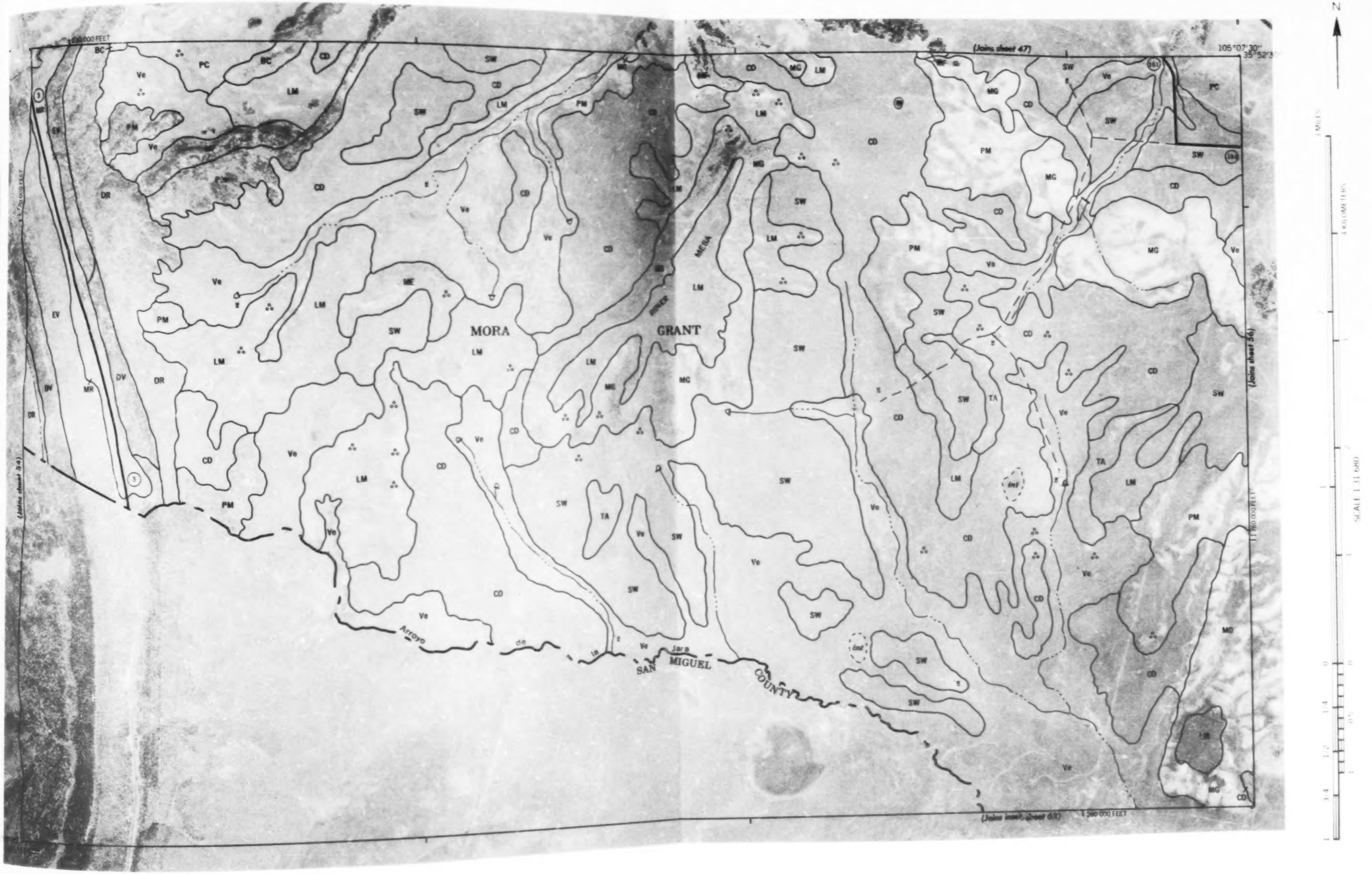
shown, are approximately positioned.


N
R. 23 E.
R. 24 E.
104°22'30"
35°56'15"
T. 20 N.
T. 19 N.
(Joins sheet 52)
9°52'30"
104°30'00"
Beaver Creek
Carrizo Creek
Cañon
Leon
SB
SA
PC
PB
BC
RO
SW
CD
HA
LM
Ms
33
34
35
36
31
32
26
27
28
25
29
30
1
2
3
4
5
7
8
9
10
11
12
13
14
15
16
17
18

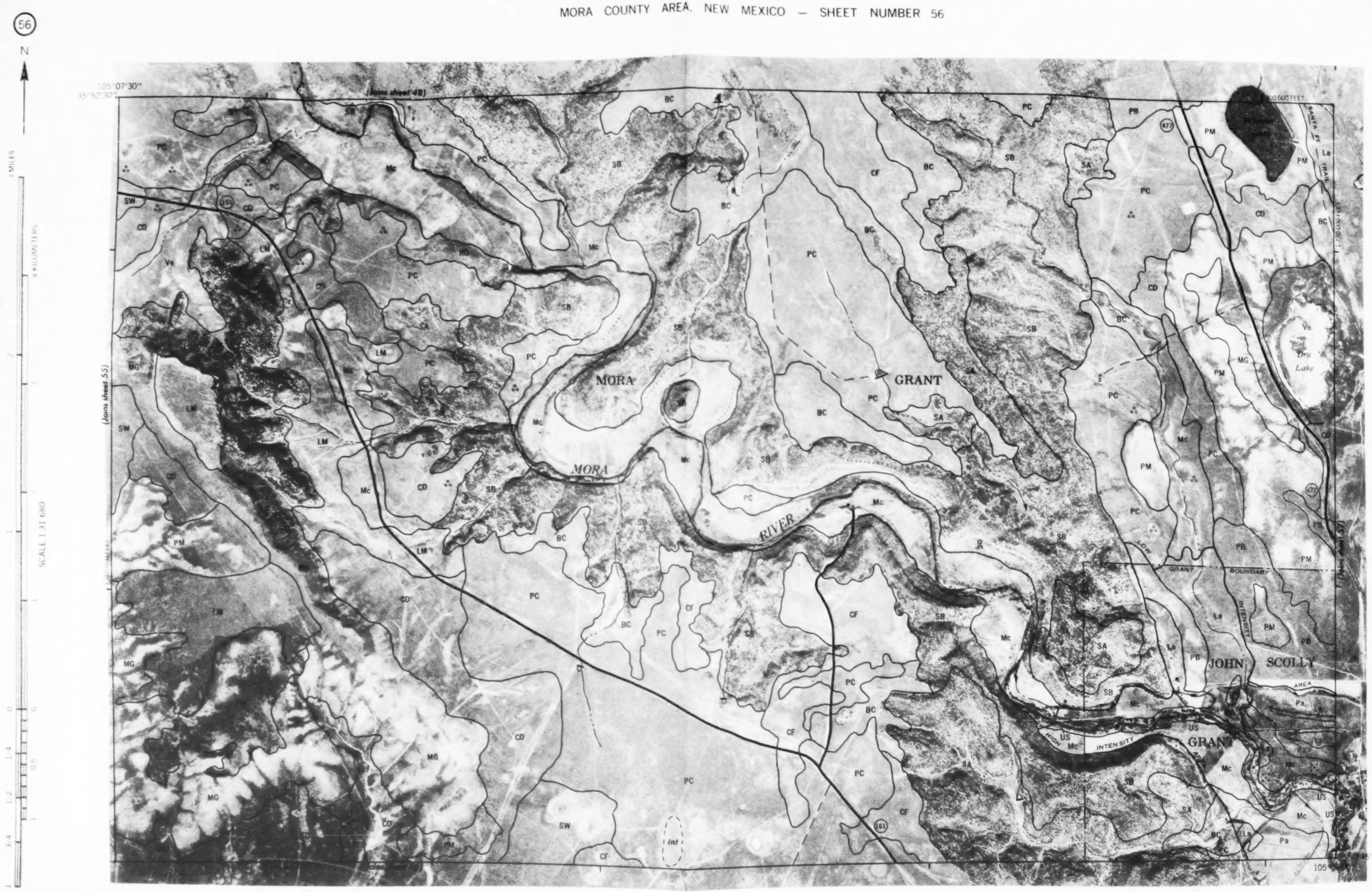
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 54


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
0.5
35°52'
(Joins sheet 46)
MR
Bd
Mh
Hb
Mo
VA
DR
MORA
MR
EV
SAN MIGUEL
Rito Cebolla
(Joins inset, sheet 67)
INSET A
HA
SB
HARDING COUNTY
CANADIAN
SAN MIGUEL
(Joins sheet
35°48'45"
105°15'00"

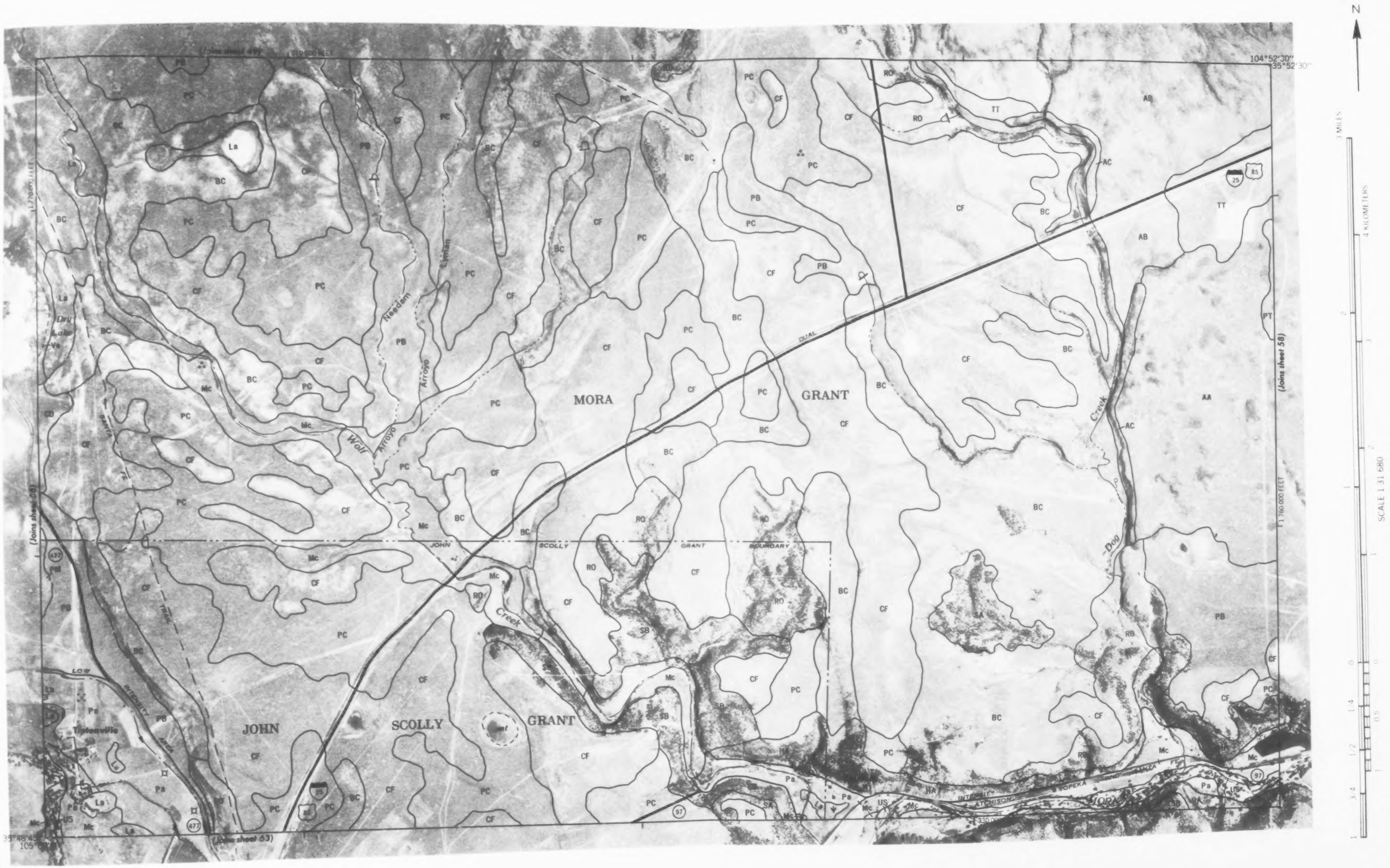
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. [illegible] shown, are approximately positioned.


(Joins sheet 47)
105°07'30"
35°52'30"
(Joins sheet 54)
(Joins sheet 56)
(Joins inset, sheet 63)
1 260 000 FEET
630 000 FEET
MORA
GRANT
MESA
Arroyo de la Jara
SAN MIGUEL COUNTY
N
MILES
KILOMETERS
SCALE 1:31 680
BC
PC
CD
Ve
LM
SW
PM
MG
DR
DV
EV
MR
ME
TA
Ins
161
3

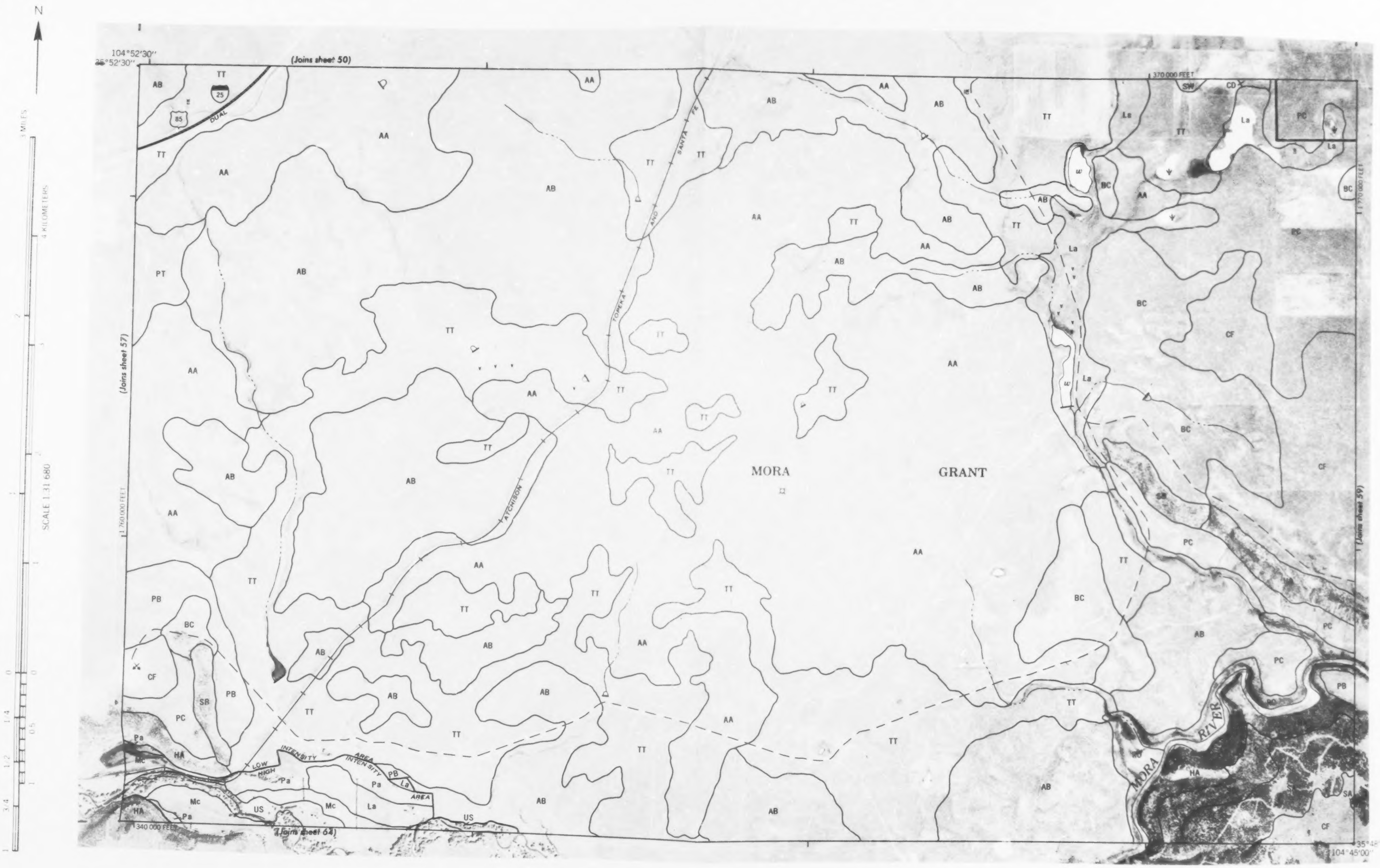
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 56


56
N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°07'30"
35°52'30"
(Joins sheet 48)
(Joins sheet 55)
(Joins sheet 57)
1 730 000 FEET
MORA
GRANT
MORA RIVER
JOHN SCOLLY
GRANT
LOW INTENSITY
HIGH INTENSITY
GRANT BOUNDARY
AREA
SANTA FE TRAIL
Dry Lake
161
477
PC
SB
BC
CF
Mc
CD
SW
Ve
LM
SA
MG
PM
PB
La
Pa
US
int

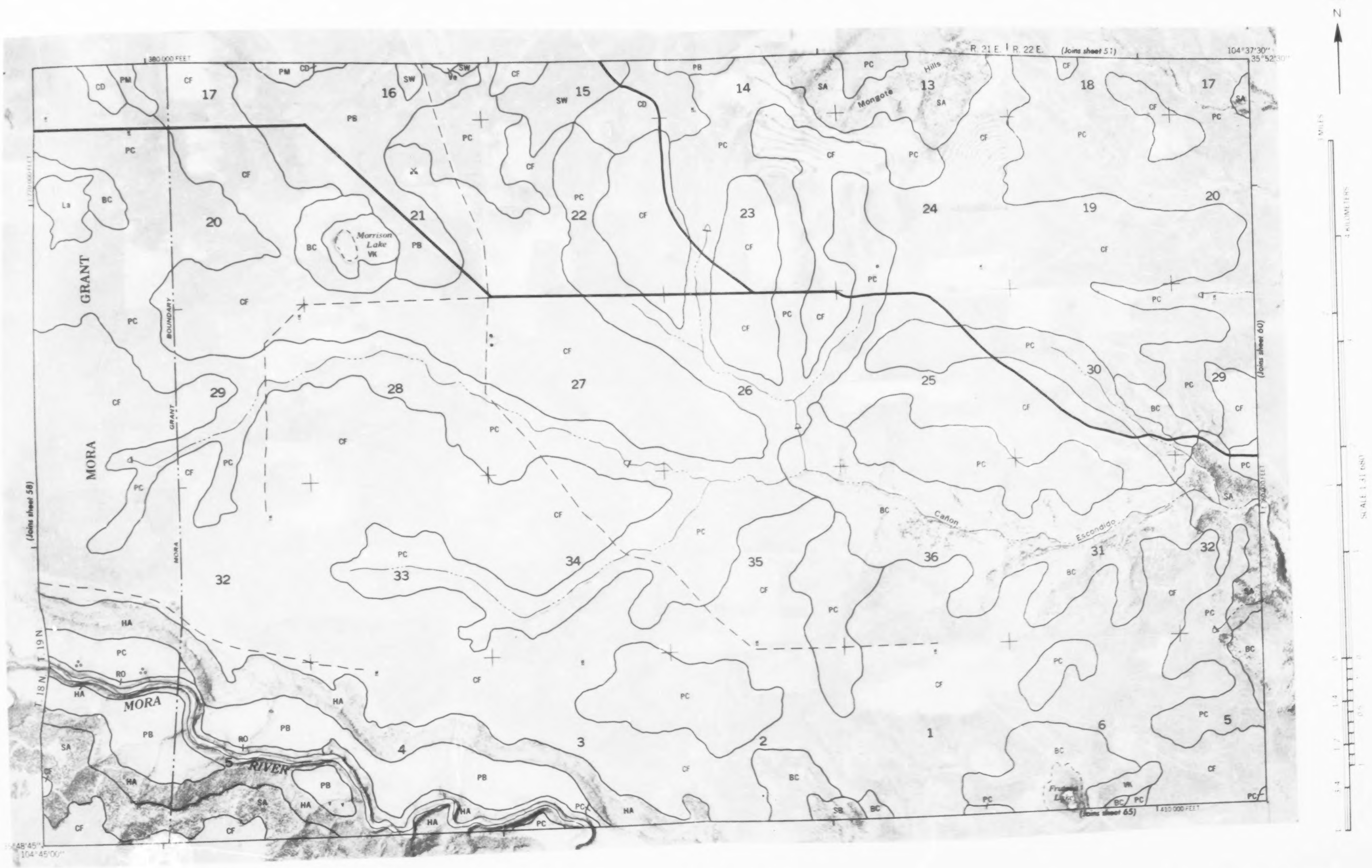
This map is compiled on 1981 aerial photography by the U.S. Department of Agriculture, Soil Conservation Service and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
(Joins sheet 49)
(Joins sheet 50)
(Joins sheet 56)
(Joins sheet 63)
104°52'30"
35°52'30"
35°48'45"
1 760 000 FEET
MORA
GRANT
JOHN
SCOLLY
GRANT
JOHN SCOLLY GRANT BOUNDARY
Wolf Arroyo
Needam Arroyo
Lyman
Dog Creek
Creek
Dry Lake
SANTA FE TRAIL
LOW INTENSITY AREA
Tiptonville
DUAL
ATCHISON TOPEKA AND SANTA FE
MORA
25
85
477
97
3 MILES
4 KILOMETERS
SCALE 1:31 680
PC
PB
BC
CF
La
Mc
RO
SB
SA
AB
AA
AC
TT
PT
Pa
US
HA
GD

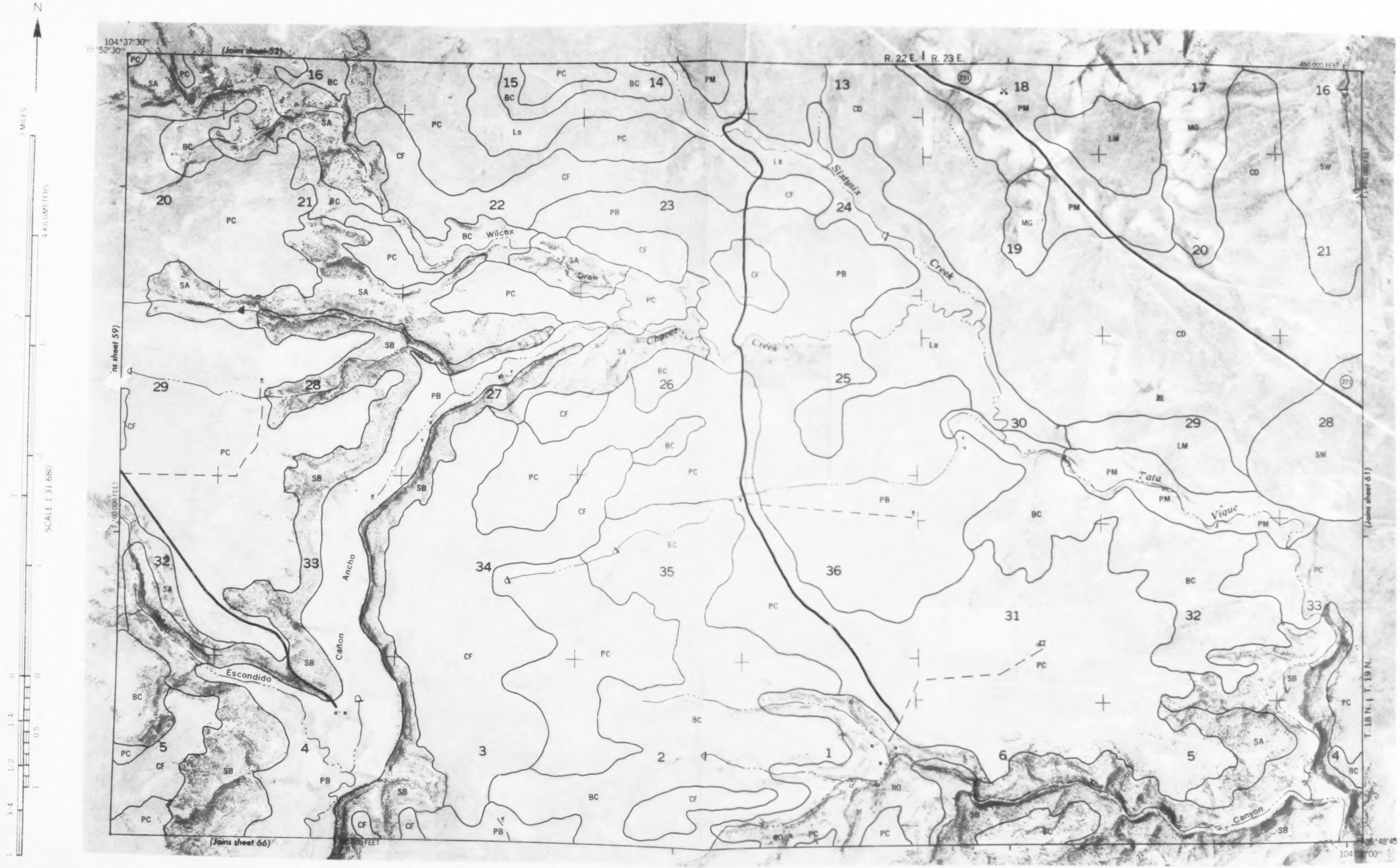
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 58


N
3 MILES
4 KILOMETERS
SCALE 1:31 680
104°52'30"
35°52'30"
(Joins sheet 50)
(Joins sheet 57)
(Joins sheet 59)
(Joins sheet 64)
370 000 FEET
1 770 000 FEET
1 760 000 FEET
340 000 FEET
35°48'45"
104°45'00"
25
85
DUAL
ATCHISON
TOPEKA
AND
SANTA
FE
MORA
GRANT
MORA
RIVER
LOW INTENSITY AREA
HIGH INTENSITY AREA
AA
AB
TT
PT
PB
BC
CF
SB
PC
Pa
Mc
HA
US
La
SW
CD
SA

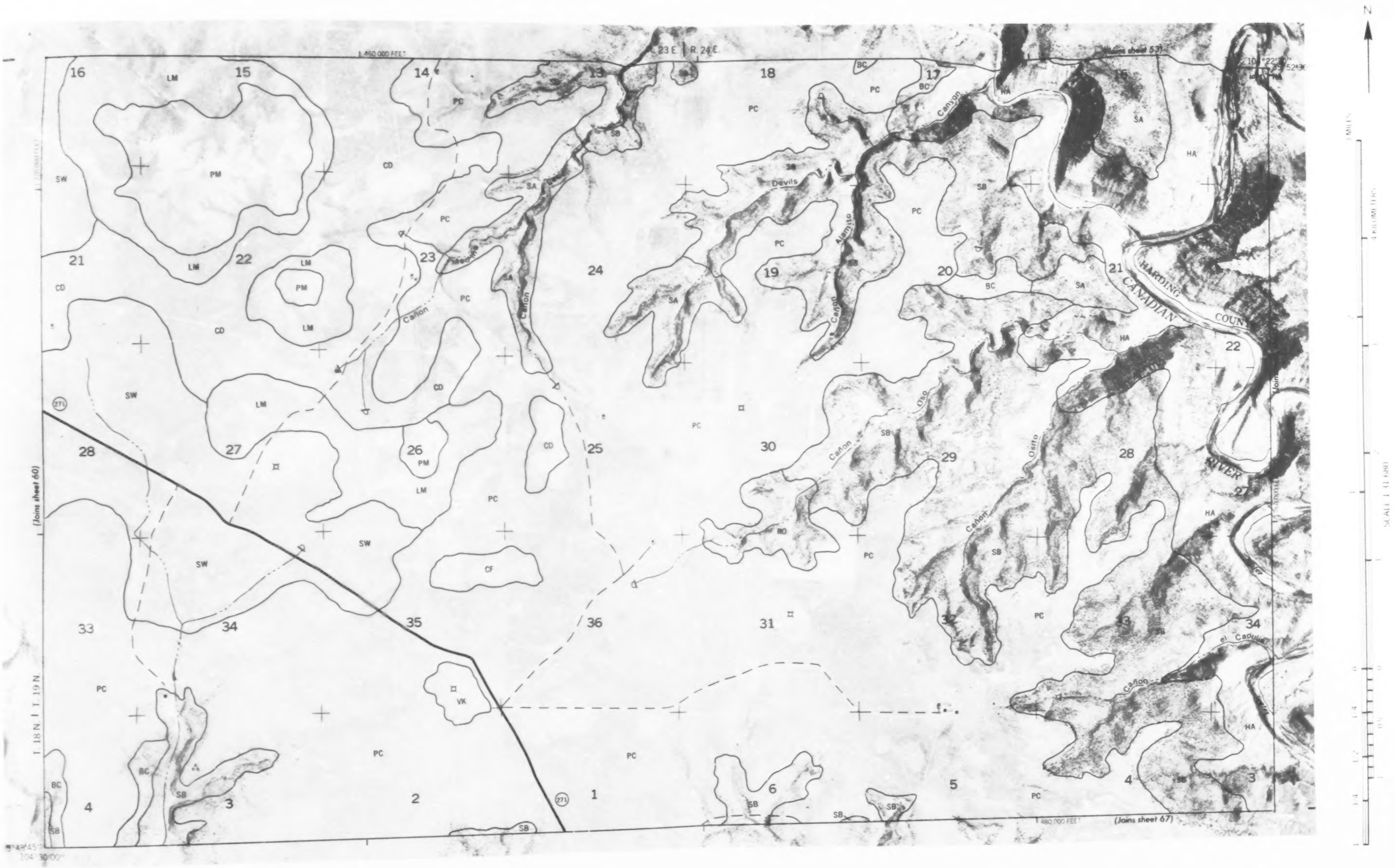
This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.


N
(Joins sheet 51)
R. 21 E.
R. 22 E.
104°37'30"
35°52'30"
380 000 FEET
(Joins sheet 58)
(Joins sheet 60)
(Joins sheet 65)
410 000 FEET
35°48'45"
104°45'00"
T. 19 N.
T. 18 N.
GRANT
MORA
GRANT BOUNDARY
MORA
Morrison Lake
Mongote Hills
Cañon Escondido
MORA RIVER
SCALE 1:31 680
3 MILES
4 KILOMETERS
17
16
15
14
13
18
17
20
21
22
23
24
19
20
29
28
27
26
25
30
29
32
33
34
35
36
31
32
4
3
2
1
6
5
CD
PM
CF
PB
SW
PC
SA
BC
La
VK
HA
RO
SB
VA

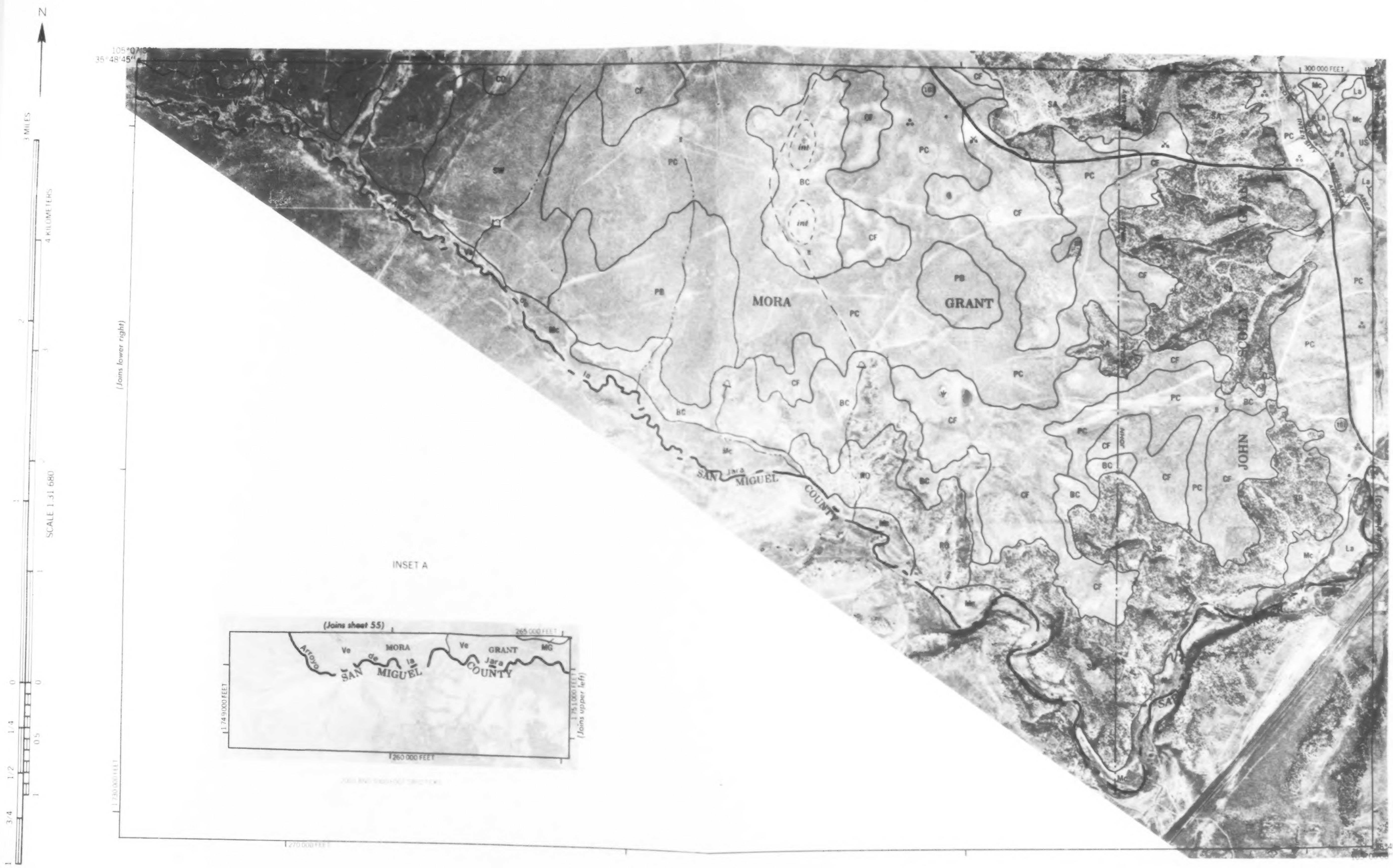
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 60


N
2 MILES
4 KILOMETERS
SCALE 1:31 680
104°37'30"
35°52'30"
(Joins sheet 53)
(Joins sheet 59)
(Joins sheet 61)
(Joins sheet 66)
R. 22 E. | R. 23 E.
T. 18 N. | T. 19 N.
104°30'00"
35°48'45"
Wilcox
Draw
Chacon
Creek
Sixtysix
Creek
Tata
Vique
Cañon
Ancho
Escondido
Canyon
271
16
15
14
13
18
17
16
20
21
22
23
24
19
20
21
29
28
27
26
25
30
29
28
32
33
34
35
36
31
32
33
5
4
3
2
1
6
5
4
PC
SA
BC
CF
La
PM
CD
MG
LM
SW
PB
SB
RO

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

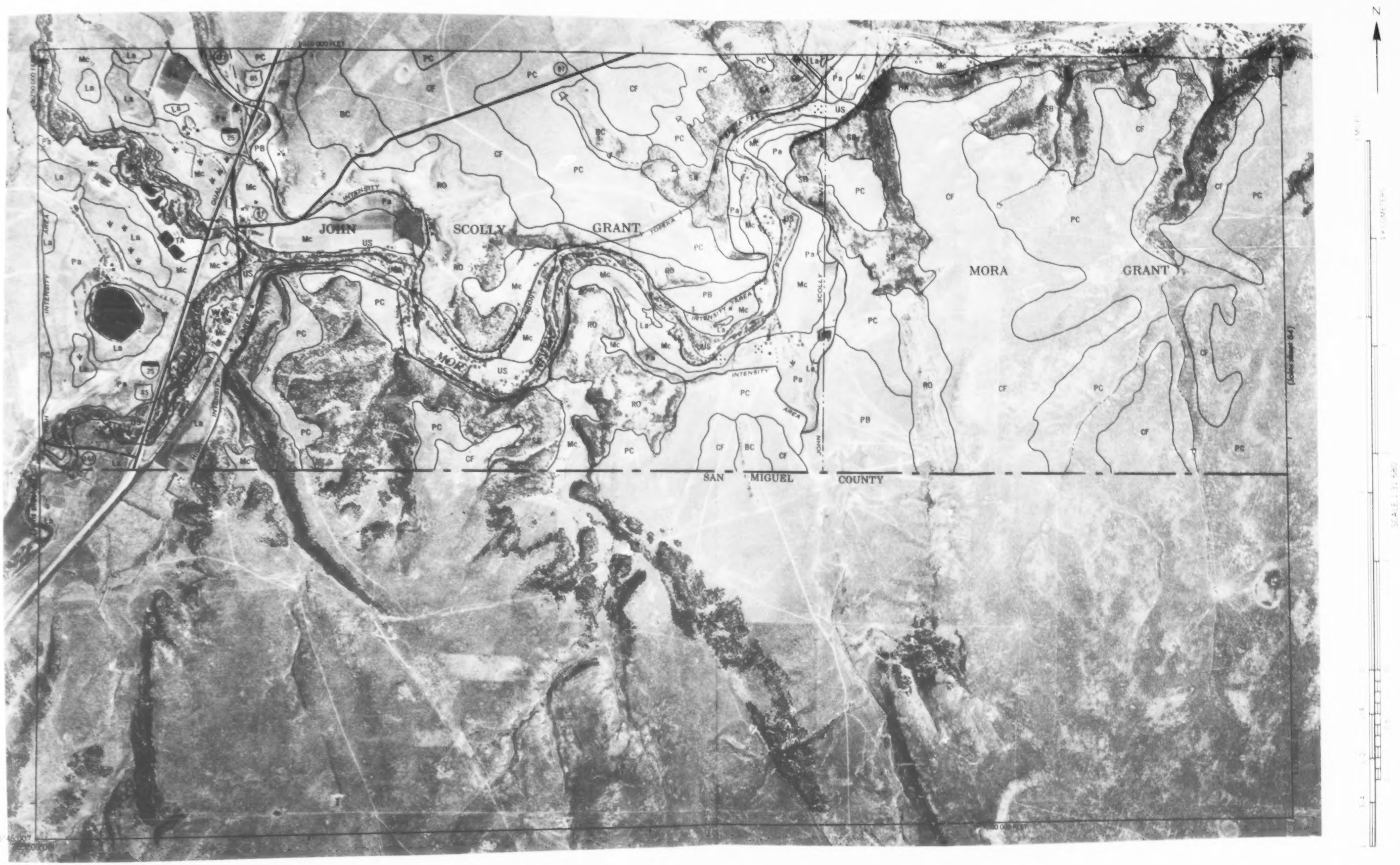

N
1 480 000 FEET
R. 23 E. | R. 24 E.
(Joins sheet 53)
(Joins sheet 60)
(Joins sheet 67)
T. 18 N. | T. 19 N.
35°48'45''
104°30'00''
104°22'30''
35°52'30''
HARDING COUNTY
CANADIAN RIVER
Devils Canyon
Alamito Cañon
Medio Cañon
Oso Cañon
Osito Cañon
el Capulin Cañon
271
1 MILE
4 KILOMETERS
SCALE 1:31 680
16
15
14
13
18
17
21
22
23
24
19
20
28
27
26
25
30
29
33
34
35
36
31
32
4
3
2
1
6
5
LM
PM
SW
CD
PC
SA
SB
BC
HA
CF
VK
RO

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 62

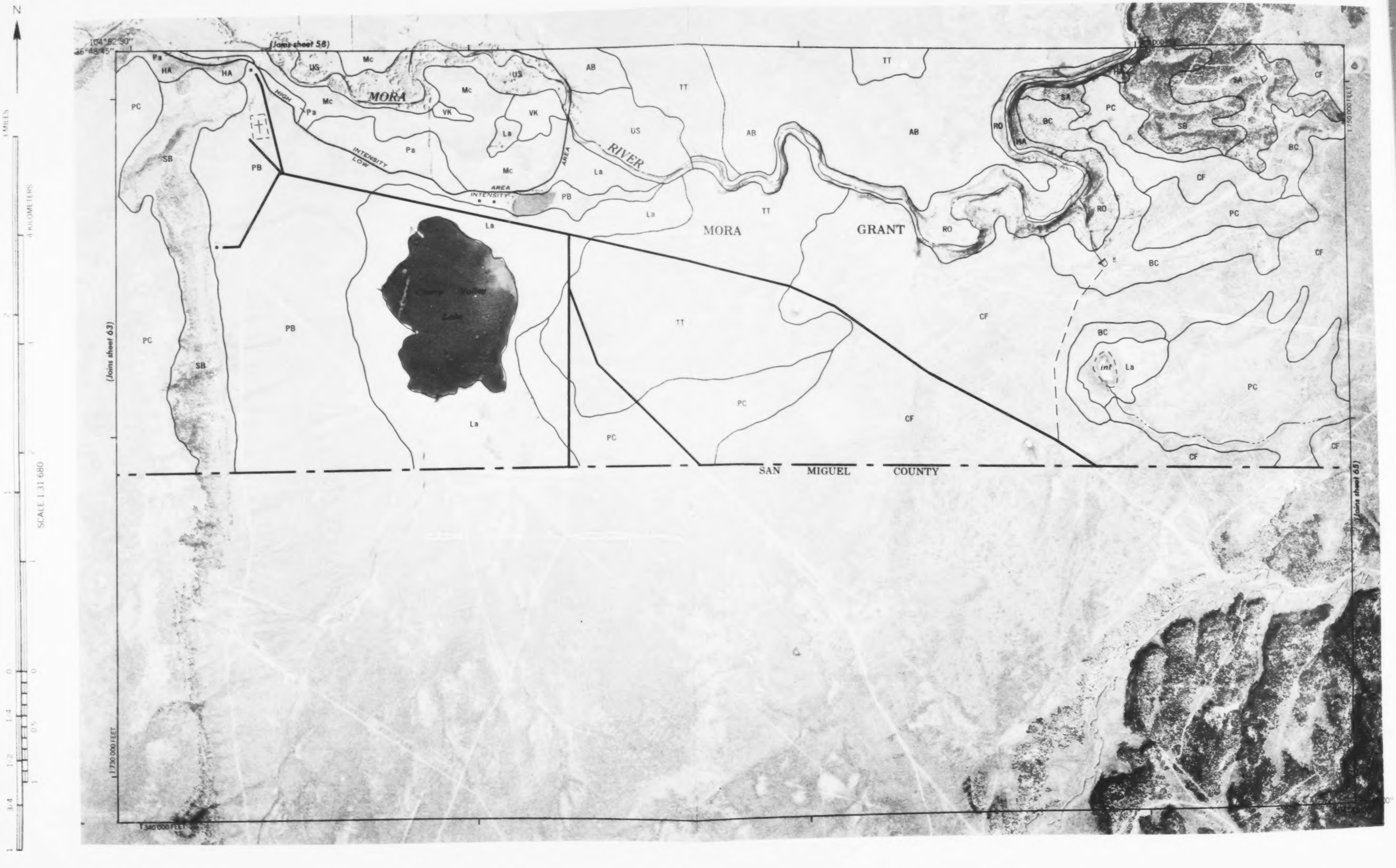

N
3 MILES
4 KILOMETERS
SCALE 1:31 680
105°07'30"
35°48'45"
300 000 FEET
(Joins lower right)
MORA
GRANT
JOHN
SCULLY
SAN MIGUEL COUNTY
CF
PC
PB
BC
SW
Mc
La
SA
SB
CD
Int
INSET A
(Joins sheet 55)
Arroyo de la Jara
Ve
MORA
GRANT
MG
SAN MIGUEL COUNTY
265 000 FEET
260 000 FEET
1 749 000 FEET
1 751 000 FEET
(Joins upper left)
270 000 FEET
1 730 000 FEET
35°45'00"

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

This soil survey map was compiled ... agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if

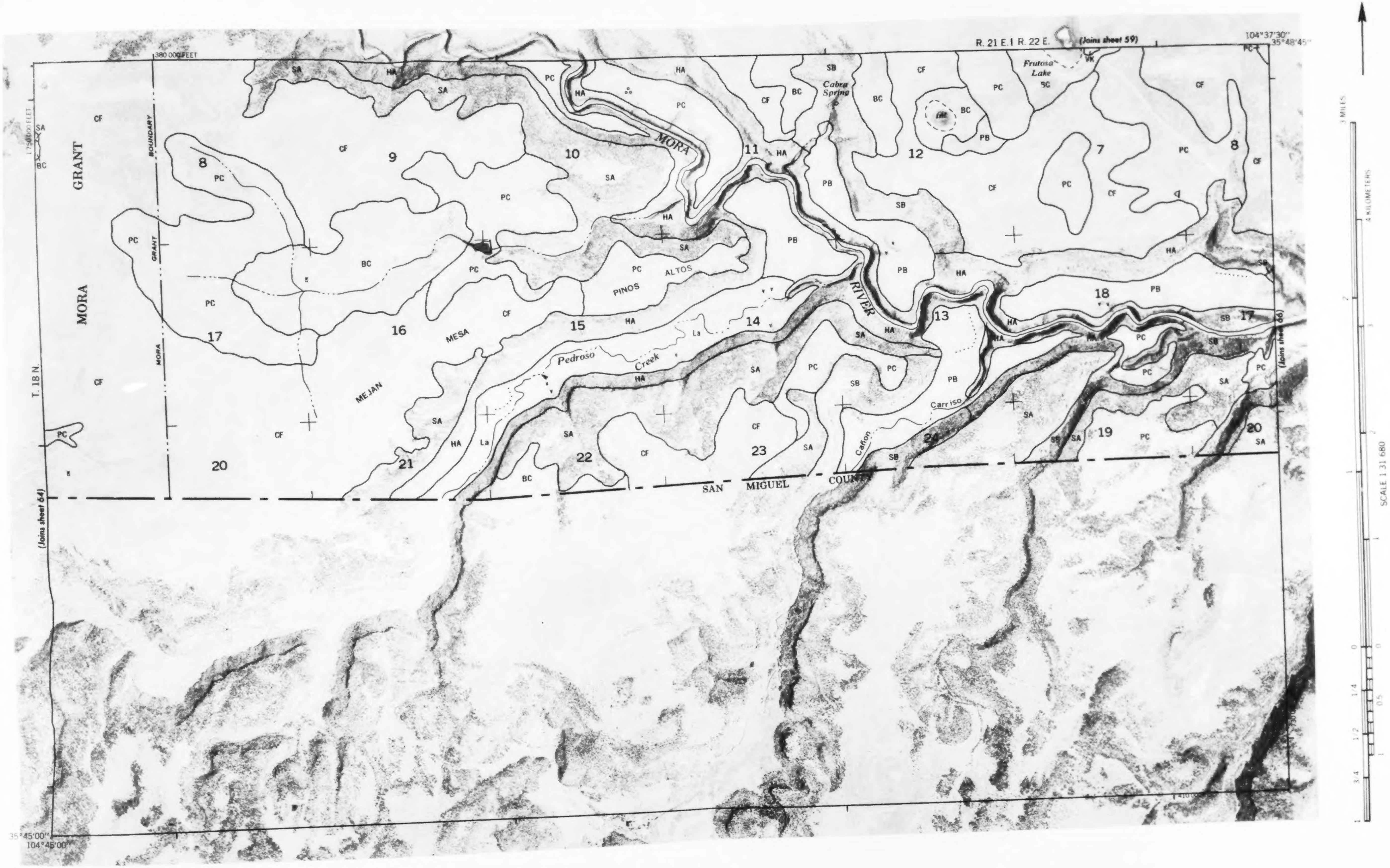

N
JOHN
SCOLLY
GRANT
MORA
GRANT
SAN
MIGUEL
COUNTY
INTENSITY AREA
(Joins sheet 64)
PC
CF
BC
RO
Mc
La
Pa
PB
US
SB
HA
TA
25
85
97
SCALE 1:31 680

MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 64


64
N
3 MILES
4 KILOMETERS
SCALE 1:31 680
0
1/4
1/2
3/4
1
2
0.5
104°52'30"
35°48'45"
(Joins sheet 58)
(Joins sheet 63)
(Joins sheet 65)
1 730 000 FEET
1 750 000 FEET
340 000 FEET
MORA
RIVER
MORA GRANT
HIGH INTENSITY AREA
LOW INTENSITY AREA
SAN MIGUEL COUNTY
Pa
HA
US
Mc
VK
La
AB
TT
PC
SB
PB
RO
SA
BC
CF
int

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

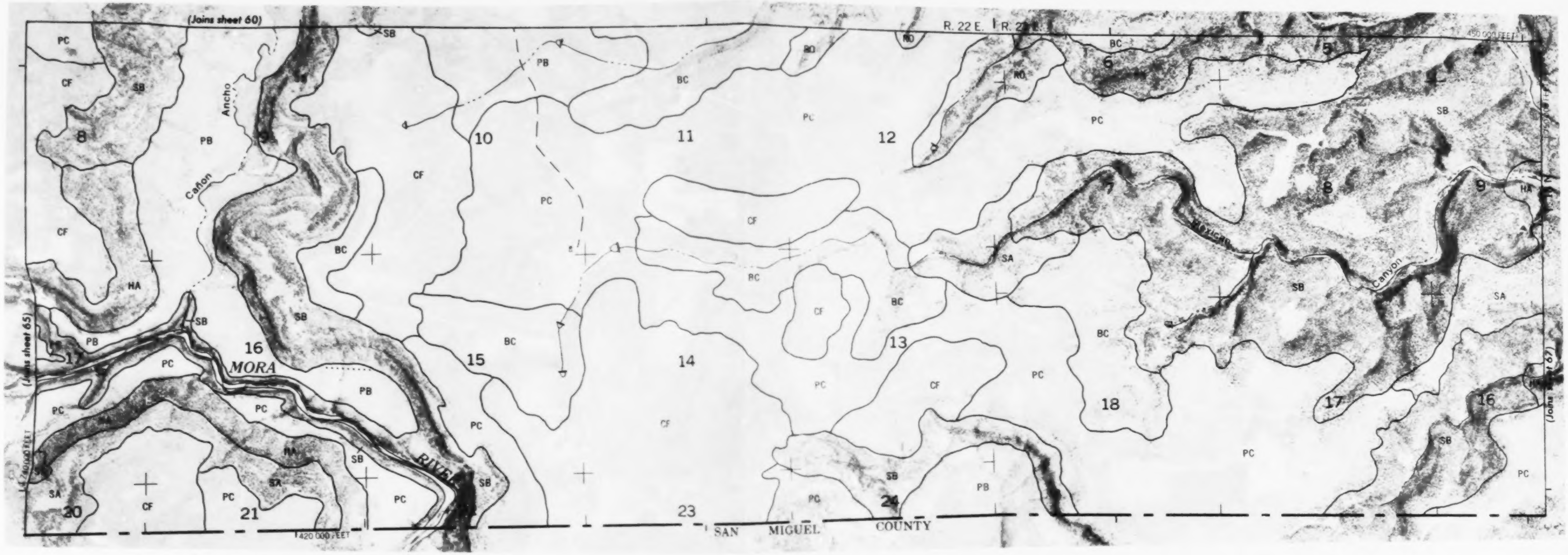
This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned


N
R. 21 E. | R. 22 E.
(Joins sheet 59)
104°37'30"
35°48'45"
380 000 FEET
1 750 000 FEET
GRANT
MORA
GRANT
BOUNDARY
MORA
T. 18 N.
(Joins sheet 64)
(Joins sheet 66)
MORA
RIVER
Cabra Spring
Frutosa Lake
PINOS ALTOS
MEJAN MESA
Pedroso Creek
Carriso Cañon
SAN MIGUEL COUNTY
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
SA HA PC CF BC SB PB La VK
35°45'00"
104°45'00"
3 MILES
4 KILOMETERS
SCALE 1:31 680

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

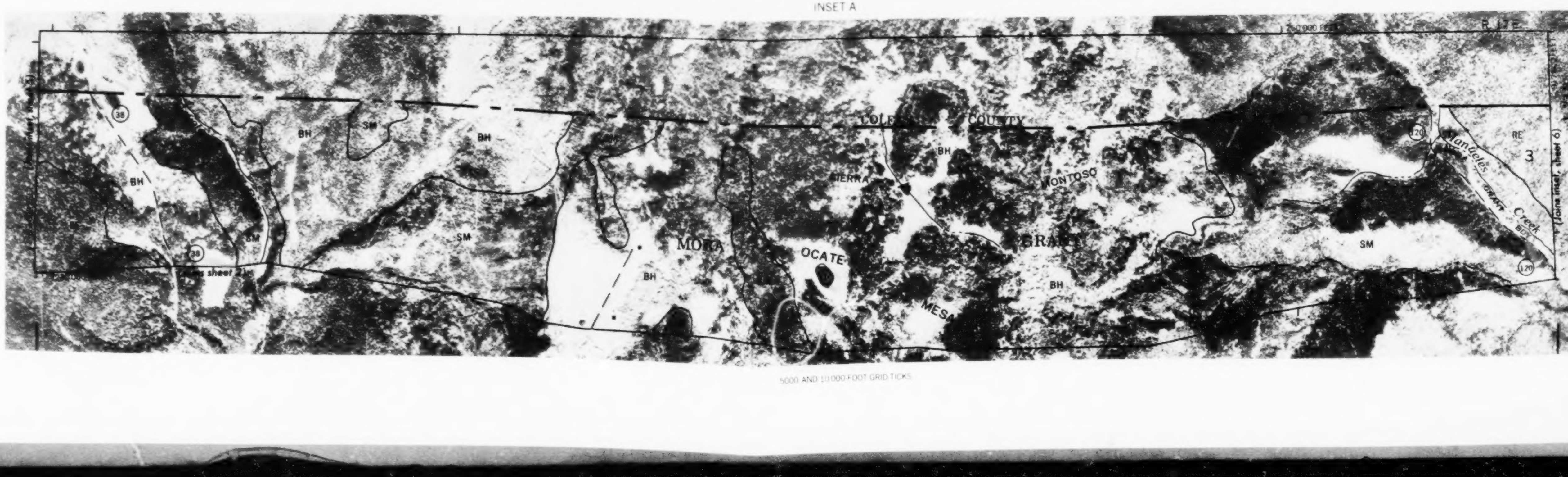
MORA COUNTY AREA, NEW MEXICO — SHEET NUMBER 66

N
3 MILES
4 KILOMETERS
2
3
2
1
SCALE 1:31 680
1
0
0
1/4
0.5
1/2
3/4
1



(Joins sheet 60)
R. 22 E.
R. 23 E.
450 000 FEET
(Joins sheet 65)
(Joins sheet 67)
Ancho
Cañon
MORA
RIVER
Canyon
SAN MIGUEL COUNTY
420 000 FEET
PC
CF
SB
PB
BC
RO
HA
SA
CF
8
9
10
11
12
5
6
7
8
9
13
14
15
16
17
18
16
17
20
21
23
24

INSET A



R. 17 E.
COLFAX
COUNTY
MORA
OCATE
SIERNA
MONTOSO
GRANT
MESA
Manueles
Creek
(Joins sheet 2)
(Joins inset, sheet 6)
38
38
120
120
BH
SM
RE
3

5000 AND 10 000 FOOT GRID TICKS

This soil survey map was compiled by the U. S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are prepared from 1981 aerial photography. Coordinate grid ticks and land division corners, if shown, **are approximately positioned.**

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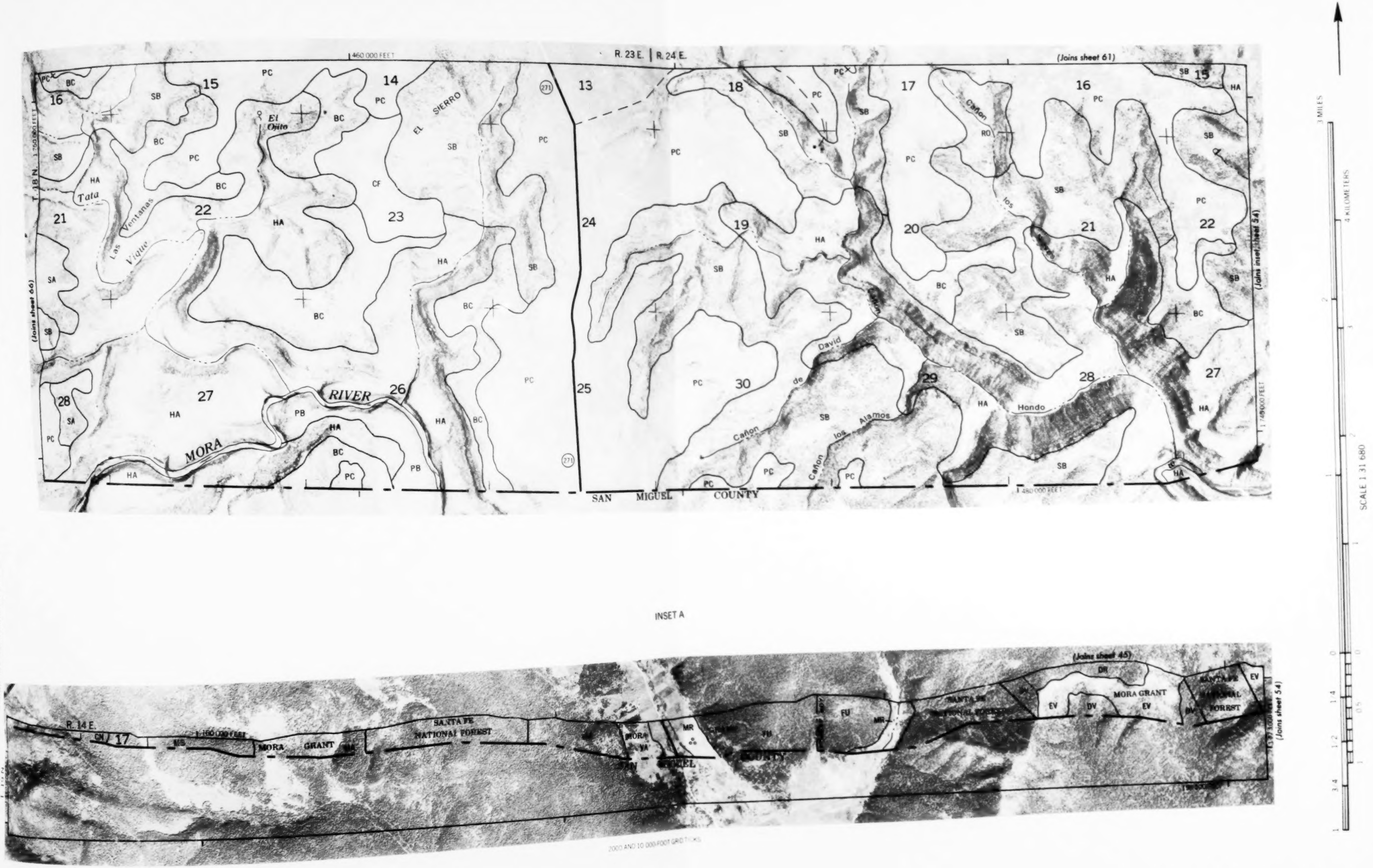
N
R. 23 E. | R. 24 E.
460 000 FEET
(Joins sheet 61)
(Joins sheet 66)
(Joins inset, sheet 54)
T. 18 N.
1 750 000 FEET
1 740 000 FEET
480 000 FEET
El Ojito
EL SIERRO
Las Ventanas
Tata
Vique
MORA RIVER
Cañon los
Cañon de David
Cañon los Alamos
Hondo
SAN MIGUEL COUNTY
PC
BC
SB
HA
CF
SA
PB
RO
INSET A
(Joins sheet 45)
(Joins sheet 54)
R. 14 E.
SANTA FE NATIONAL FOREST
MORA GRANT
SAN MIGUEL COUNTY
MR
FU
EV
DV
DR
2000 AND 10 000-FOOT GRID TICKS
3 MILES
4 KILOMETERS
SCALE 1:31 680